Report.

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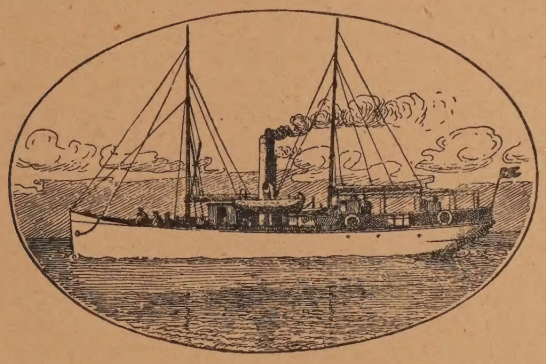
of

The Danish Biological Station

to

The Ministry of Shipping and Fisheries



XXXVI.

1930.

By

A. C. Johansen, Ph. D.
Director.

Copenhagen. C. A. Reitzel.
1930.

The Reports from the Danish Biological Station (Nos. I—XXI) are published in the official Danish "Fiskeri-Beretning" for the years 1890—91 until 1912. After this year they appear as special publications. The Reports I—XXXII are edited by the late Dr. C. G. Joh. Petersen, the Reports XXXIII—XXXV by Dr. A. C. Johansen.

I. *C. G. Joh. Petersen:* Fiskenes biologiske Forhold i Holbæk Fjord. (1890—91*) 63 pp. 1 Chart. Out of print.

II. *Idem:* On the Eggs and Breeding of our Gobiidæ. (1891—92.) 9 pp. Two Plates. Out of print.

III. *Idem:* The Pelagic Life in Fænø Sound etc. (1892—93.) 38 pp. Tables. Out of print.

IV. *Idem:* On the Biology of our Flat-fishes and on the decrease of our Flat-fish Fisheries. (1893—94.) 146 pp. 2 Plates. 1 Chart. Many Tables. Out of print.

V. *Idem:* The common Eel (*Anguilla vulgaris* T.) gets a Particular Breeding-dress before its Emigration to the Sea. (1894—95.) 35 pp. With 2 Plates.
Etc. 64 pp. Out of print.

VI. *Idem:* The Yearly Immigration of young Plaice into the Limfjord etc. (1895—96). 48 pp. 1 Chart. 2 Tables. Out of print.

VII. *Idem:* Plankton-Studies in the Limfjord. 1897. 23 pp. 1 Map. 4 Tables. Out of print.

VIII. *Idem:* An Otter-Seine for the Exploration of Deeper-Seas. 1898. 24 pp. With 10 Figures. Out of print.

IX. *Idem:* Trawlings in the Skager Rack and the Northern Cattegat in 1897 and 98. 1899. 56 pp. With one Map. Out of print.

X. *Idem:* List of the "Aalerusestader" in Denmark etc. — Smaller Communications. 1899 and 1900. 37 pp.

XI. *Idem:* I. The Biology of the Cod in the Danish Seas. II. On other Codfishes in our Seas. III. Some General Observations on Protection, Legislation etc. IV. Alterations and Improvements on Otter-seines for Zoological Purposes. 1900 and 1901. 44 pp.

XII. *Idem:* I. Where, and under what Conditions, can the Eggs of Plaice be developed into Young Fish within the Skaw? II. On the Young Stages of the genus *Zeugopterus*. (With one Plate). III. Can we enter into Competition with the Foreign Steam-trawlers in our Seas outside the Danish Territorial Limit. 1902 and 1903. 33 pp.

XIII. *A. Otterstrøm:* Eggs and Young of Fishes in the Danish Waters. (Investigations during 1904 and earlier years.) 1903 and 1904. 85 pp.

XIV. I. *C. G. Joh. Petersen:* The Influence of Light on the Migrations of the Eel. II. *K. I. Gemzøe:* Age and Rate of Growth of the Eel. 1906. 39 pp.

XV. *Idem:* I. First Report on the Oysters and Oyster Fisheries in the Lim Fjord. (70 pp.) 1908.

XVI. *C. H. Ostenfeld:* On the Ecology and Distribution of the Grass Wrack (*Zostera marina*) in Danish Waters. With 9 figures. 1908. 62 pp.

XVII. *C. G. Joh. Petersen:* II. Second Report on the Oyster and Oyster Fisheries in the Lim Fjord. 1908. (24 pp).

XVIII. *C. G. Joh. Petersen:* I. The Yield of the Limfjord fisheries in recent years and the transplantation of Plaice in 1908. With 6 tables and 1 Chart. II. Biological investigations on the stock of Plaice in the Limfjord. With 3 Tables. III. The Yield of the Prawn fishery from 1885—1907 and its improvement by means of protection. With 3 Tables. 25 pp. 1909.

XIX. *Idem:* Some Experiments on the Possibility of combating the harmful Animals of the Fisheries, especially the Whelks in the Limfjord. 20 pp. 1911.

XX. *C. G. Joh. Petersen* og *P. Boysen Jensen:* Valuation of the Sea. I. Animal Life of the Sea-Bottom, its food and quantity. With 6 Tables, 3 Charts and 6 Plates. 81 pp. 1911.

*) The figures in ( ) refer to the "Fiskeri-Beretning" for the years quoted.

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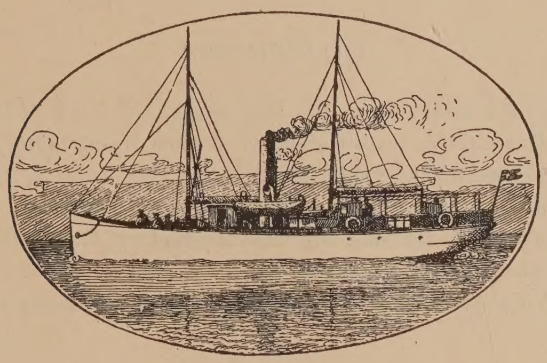

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I.

Quantitative Investigations of Bottom Invertebrates in the Kattegat with Special Reference to the Plaice Food.

By

H. BLEGVAD

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C. G. Joh. Petersen published in 1913 (Rep. of the Dan. Biol. St. XXI) the results of the quantitative investigations with his bottom sampler, the "Petersen Grab", in Danish waters up to 1912 incl. Later on, another series of such investigations ("valuations") has been carried out by the Danish Biological Station in the Kattegat; at the same time quantitative analyses of the stomach contents of plaice have been carried out in the same waters. It will be the aim of the present paper to compare the results of these two series of investigations in such a way as to throw a light upon the conditions of nourishment of the plaice in the Kattegat, with special reference to the nursery grounds of the plaice in the western Kattegat.

In the following the valuations and the stomach analyses will at first be dealt with separately and then the results will be compared.

A. The Valuations.

While the valuations of earlier years (see Rep. of Dan. Biol. St. XXI, Appendix p. 1—14) were carried out in such a way, that a greater number of bottom samples were taken in the immediate vicinity of each other at each station, it has been the principle of the later valuations to take a series of stations with rather great intervals but within the same animal community and to take only one or two samples of 0.1 sq. m. at each station. Such a series of valuations is indicated by its extremes and by the animal community in which it has been taken, e.g. "Gjerrild-Hals E.v.", where E.v. means the *Echinocardium-Venus* community (see designations of animal communities of Danish waters, Rep. of Dan. Biol. St. XXIII, p. 8). On the map p. 21 the valuation stations have been marked out with affixed designations of series and communities. In the original valuation lists the number of animals taken at each station is put down; in the tables 1—8 found at the end of this paper there has for want of space been taken only the summed up number of individuals of each series, while still each species has, as far as possible, been kept apart. At the determination of several of the animal forms I have received valuable assistance from the staff of the Zoological Museum of Copenhagen; I render

my thanks especially to Mrssrs. Hj. Ditlevsen, Mag. sc., K. Stephensen, Cand. mag., P. Kramp, Mag. sc., R. Spärck, Ph. D., and Mrs. E. Wesenberg-Lund, Mag. sc.

In tables 1—8 at the end of this paper the grab material has been arranged, so that the series of valuations taken in the same animal community are joined, yet in such a way, that the series which fall within the nursery grounds roughly limited by the line Fornæs—the western end of Læsø—Northern Rønner Light —The Skaw Lightship (marked out on the map p. 21 by a heavy black line) are separated from those falling outside this line; finally with respect to the animal communities of shallower water a distinction has been made between the series of valuations falling chiefly north of a line from Hals and eastwards and those falling south of this line. Thus we get 8 different areas of the Kattegat, of which tables 1—8 illustrate the respective stock of bottom animals:—

1. The *Venus* community with or without *Echinocardium cordatum* S. of Hals, W. of the line.
2. The *Venus* community with or without *Echinocardium cordatum* N. of Hals, W. of the line.
3. The *Amphiura filiformis* community ± *Echinocardium cordatum* N. of Hals, W. of the line.
4. The *Venus* community ± *Echinocardium cordatum* S. of Hals, E. of the line.
5. The *Venus* community ± *Echinocardium cordatum* N. of Hals, E. of the line.
6. The *Amphiura filiformis* community with *Echinocardium cordatum* S. of Hals, E. of the line.
7. The *Brissopsis-Amphiura Chiajei* community, E. of the line.
8. The *Haploops* community, E. of the line.

Contrary to earlier practice both the *Polychaeta*, esp. the genus *Nephthys* and the *Amphipoda* and *Cumacea* have been, as far as possible, determined i. r. to species. In several cases, however, the material was badly preserved, sometimes wholly or partly dried up, so that an exact determination was rendered difficult or had to be given up completely.

It appears from the tables that *Nephthys hombergi* is indisputably the most common polychaete species in the Kattegat; it can be found in all communities. In the *Venus* communities it is found together with *N. longosetosa;* The species *N. coeca* and *N. ciliata* are sparse and rather few of number, and *N. incisa* and *N. rubella* are confined to the deaper eastern and south-eastern parts of the Kattegat.

Of the *Amphipoda Ampelisca brevicornis* is, as may be seen from the lists, by far the dominating species of the *Venus* communities; it is also found in rather great number in the *Echinocardium-Amph. filiformis* communities of the southern

Kattegat, but is in the *Brissopsis-Amph. Chiajei* and the *Haploops* communities replaced by *Haploops tubicola* as the dominating ampiphod species.

Otherwise the quantitative distribution of the bottom animals will be dealt with in Chapter C.

B. Quantitative Analyses of Stomach Contents of Plaice.

In my earlier paper on the Food of Fish in Danish waters (Rep. of Dan. Biol. St. XXIV, 1916) were published some quantitative investigations of the stomach contents of plaice in various communities of bottom animals in the Kattegat. While these investigations sufficed for the purpose of giving on rough lines an idea of the bottom animals quantitatively playing the greatest part for the stock of plaice as a whole, they are less adapted to make out the basis of a comparison with the valuations given in tables 1—8; on one side no attention has been paid to the age of the plaice examined, on the other side the material must be classified on the lines of the classification of the grab material mentioned above. Therefore I have once more looked over all the analyses of plaice stomachs made by the Biological Station up to the present date.

H. Hertling (Ber. d. Deutsch. Wiss. Komm. f. Meeresforschung, N. F. Bd. IV, Heft 2, 1928) in a paper on the food of the plaice (and other flat fish) in the Baltic has employed the method of counting how many individuals of the various species of bottom animals were found in the stomachs of the fish examined and then to compare the found numbers with the figures from the valuations near the place of capture. If, however, information is wanted as to the question: which species of food animals are of the greatest importance for the nourishment of the plaice, it is not sufficient to determine the number of individuals of food animals found in the stomachs; it is necessary to state their weight because e.g. 20 individuals of a small lamellibranch species may well be of less importance for the nourishment of the plaice than one single specimen of a bigger and heavier bivalve. The ideal of course would be to determine the caloric value of the found food animals; as we are still, however, on rather new ground in this respect, we may for the present be contented to state their weight; we will then in the proportionate weight of the various food animals have an approximate expression of their value as a feeding matter for the plaice within the investigated area.

I have therefore made up my mind to employ the following manner of proceeding:—

Immediately after capture the contents of stomachs and intestines of all the plaice were prepared out, and the species of bottom animals occurring therein were taken down together with a statement of the proportional weight percentage of each species. After various attempts to determine the weight directly by weighing or measuring of volume I have chosen to fix the weight percentage at an estimate. In the first place it has proved to be practically impossible to sort the more or less

digested contents of stomachs and intestines so carefully, that one is able to ascertain the precise weight of the different species, secondly the sorting is a very troublesome and timewasting work; finally it has turned out at various experiments that after some practice it is possible to make a rather precise estimate of the weight percentage of the single species of food animals. In the present case all the determinations have without exception been made by the author himself, so that the material has been dealt with altogether uniformly. In several, but not nearly all cases the whole stomach contents has been weighed; however, in order to utilize the whole material I have chosen to use the number of the examined plaice as an expression of the weight of the examined stomach contents, these two quantities being practically proportional when speaking about plaice, taken at day-time and of fairly the same weight. In order to attain this the material has been classified into 3 great groups: the 0-Group or plaice at the age of 0—1 year, the I-Group or plaice at the age of 1—2 years, and the II-Group and older i. e. plaice more than 2 years old. Within these groups the material has again, as far as possible, been classified in accordance with the classification of the valuations as mentioned above.

In the lists of the analyses of the stomach contents[1]) (tables A—F) the figures at the single species of food animals were attained by multiplying the number of the examined plaice with the weight per cent. of the species in question out of the whole stomach contents. The figures found in this way I have called the Weight-Index figures. By summing up the single Index figures of each food animal we get a picture of the value of the species in question as a feeding matter in proportion to the other animals found as food animals of the plaice in question, and within the area where the plaice have been caught. As a sort of control of these Total-Index figures put down to the right in the tables is also stated the Frequency of the single species of food animals, i. e. figures stating at how many investigations this particular species has been met with as part of the stomach contents. It is namely obvious that if e. g. a certain species has a very high total-index figure, but the frequency 1, i. e. has been found only at one investigation, the value of the species as a feeding matter is locally confined and therefore not of the same importance for the whole area as a species with the same Total Index figure but with a high frequency. Otherwise the material has within the single frames been arranged after seasons in order to facilitate the general view of the season's influence on the choice of food.

C. Comparison of Valuations and Stomach Analyses.

In table A are put down the results of the stomach investigations of 119 plaice of the 0-Group (bottom stage) from the coast N. of Hals and 218 plaice from various places of the Kattegat coast S. of Hals. It will be seen that the food to a great extent consists of pelagic organisms as Copepoda, Cladocera, and lamellibranch larvae

[1]) Here and in the following stomach contents means contents of stomach and intestine.

and therefore cannot be compared with the valuation lists. Otherwise it appears from the table that small Crustacea are the main food of the plaice during the first months of the bottom stage, partly (and specially) Copepoda, partly Amphipoda (esp. fry), Cladocera, and Ostracoda; as a curious fact may be mentioned that the small Cumacea species *Bodotria pulchella* G. O. Sars was in several cases met with in considerable numbers in the stomach contents of plaice of the 0-Group at the coast N. of Hals, although in "Danmarks Fauna" No. 9, 1910 (K. Stephensen: Storkrebs I) it is reported that only two specimens of this species were hitherto known from Danish waters. After the Crustacea small Chaetopods like Spionidæ and Naidæ together with pelagic lamellibranch larvae play the most prominent part in June—July. Not until the month of September do the plaice of the 0-Group begin to attain such a size, that they are able to consume the bottom forms of lamellibranchs, esp. *Spisula subtruncata*, which at this season is the most common bivalve of the *Venus* community (see table 1).

In tables B and C are given the weight-index figures for food animals found in respectively 508 and 553 plaice of the I-Group, caught in *Venus* communities within the nursery grounds, resp. N. and S. of Hals. In both cases the worms predominate, both in weight and frequency, and within these again the *Nephthys* species (principally *N. hombergi*); as No. 2 in frequency (S. of Hals also in weight) come hind parts of *Arenicola marina;* it seems to be a fact that the plaice bite off the *Arenicola's* hind part when it is thrust out of the sand in order to deliver the fæces; as yet the plaice are obviously too small to eat the whole *Arenicola.* Two other Polychaeta are of great importance as food of the young plaice in their second year, viz. *Scoloplos armiger* (esp. S. of Hals) and *Pectinaria koreni;* of the latter species particularly the 0-Group from the end of June is a favourite feeding matter.

After the worms, which amount to more than 50 % of the total stomach contents, come the *Lamellibranchs* with about 25 % both N. and S. of Hals. Among these the 0-Group of *Spisula subtruncata* is absolutely predominant although it does not appear until the end of June but then in return in great quantities.

The next greater group comprises the *Crustacea*, which amount to 16.9 and 7 % of the total stomach contents resp. N. and S. of Hals. Within this group *Ampelisca brevicornis* predominates over all other species.

The series is concluded by the *Gastropods*, of which *Philine aperta* and *Acera bullata* have great Weight-Index figures, but the Frequency is only 1.

No *Echinoderms* were found.

In table D are given the Weight-Index figures of stomach contents of 731 plaice of the II-Group or older groups from the same area as in table B (the Aalborgbugt). Here, too, the worms predominate (68 % of the whole stomach contents); esp. *Nephthys* (more particularly *N. hombergi*) comes out strongly both as to weight (23 % of the whole stomach contents) and to frequency (out of 39 investigations *Nephthys* were found in 35, i.e. 90 %); after that comes *Arenicola marina*, but now as a rule in complete specimens. Also *Pectinaria koreni* is in great favour; finally

we have as No.s 4 and 5 *Phyllodocidae* (more particularly the species *Phyllodoce maculata*) and *Ophelia limacina.*

After the worms follow in quantity but not in frequency the gastropods, mainly *Philine aperta*, which may occur locally in the Aalborgbugt in great numbers and big specimens.

A greater frequency is reached by the crustaceans, among which *Ampelisca brevicornis* once more plays the leading part, both in quantity and frequency.

The lamellibranchs here merely take up the third place because only very few investigations were carried out in the autumn; otherwise *Spisula subtruncata* would no doubt have occurred in such quantities, that the importance of the lamellibranchs, as in table B, would have been second only to that of the worms.

That we are now dealing with bigger plaice is seen from the fact that some bottom animals belonging to the category "2nd class plaice food" (see below), such as *Venus gallina*, and *Echinoderms* like young *Echinocardium cordatum* and *Echinocyamus*, occupies part of the stomach contents, although in modest numbers.

In order to compare the results of the stomach analyses with the valuation lists computations of the average contents of plaice food per sq.metre in the bottom samples have been made in the right margin of the valuation lists (Tables 1—8); the same computations have been made in each series of valuations at the foot of the tables. In every case a distinction has been made between "1st class" and "2nd class" plaice food. I have previously called attention to the fact that the fish make a pronounced selection of the bottom fauna at hand (Rep. of Dan. Biol. St. XXXI, 1925, p. 29—30, and XXXIV, 1928, p. 36); this selection is not only made within the different species but also within the various sizes of the same species; further there are bottom animals which may well be eaten by grown-up fish but is rejected by smaller fish of the same species. So I have been obliged to divide the bottom animals of the valuation lists into 3 groups: 1st Class Plaice Food, comprising the bottom animals which, wherever they occur, are eaten by plaice of all ages down to the 0- and I-Group, 2nd Class Plaice Food, comprising the bottom animals which, although numerous at the place in question, are eaten only in small quantities or can be eaten only by the oldest and greatest plaice; it is obvious that both of these last named categories of food animals are of smaller ecologic importance for the nourishment of the plaice than the rest of the food animals and therefore must be kept apart. The third group of bottom animals are those which are not at all eaten by plaice; in tables 1—8 they are put down in the column: Not Plaice Food.

After numerous investigations I have arrived at the result that the following classification may be made within the bottom animals put down in tables 1—8:

A.	B.	C.
1st Class Plaice Food	2nd Class Plaice Food	Not Plaice Food
All *Lamellibranchia* with exception of those mentioned under heading B. and C.	*Macoma calcarea* > 2 cm. All species of the genera *Venus*, *Astarte*, *Lucina*, *Dosinia*, *Leda*, *Corbula*, and *Nucula*. *Psammobia færøensis* > 2 cm. *Mactra solida* > 2 cm. *Modiolaria nigra* > 2 cm.	*Pecten* sp. > 2 cm. *Cyprina islandica* > 2 cm. *Mya* sp. > 3 cm.
Natica, all species. *Bela turricola*. *Lacuna*, all species. *Rissoa*, - — *Philine*, - — *Acera bullata*. *Cylichna cylindracea*.	*Buccinum undatum* < 0,5 g. *Aporrhais pes pelecani* < 0,5 g. *Scalaria communis*. *Trochus cinerareus*. *Acmæa testudinalis*. *Chiton*, all species.	*Buccinum undatum* > 0,5 g. *Nassa reticulata*. — *pygmæa*. *Aporrhais pes pelecani* > 0,5 g. *Turritella terebra*. *Dentalium entalis*.
Nudibranchia.		
Chætoderma nitidulum.		
All *Worms* with exception of those mentioned under heading B. and C.	*Aphrodite aculeata*. *Phascolion strombi*.	*Pomatoceros triqueter*.
	Amphiura chiajei. — *filiformis*. *Ophiura*, all species. *Echinocardium cordatum* 0-Gr. *Echinocyamus pusillus*.	All *Echinoderms* with exception of those mentioned in B.
All *Crustacea* with exception of those mentioned under heading B. and C.	Small *Paguridæ*.	Big *Eupagurus bernh*. - *Carcinus mænas*. - *Hyas* species. - *Nephrops norvegicus*.
Edwardsia chrysanthellum. *Cerianthus danielsseni*.	*Hydroidæ*.	*Actiniidæ*, with exception of those mentioned in A.
Amphioxus lanceolatus.		*Ascidiæ*. *Foraminifera*.

If now tables B and D at the end of this paper are compared with table 1, which represents the bottom animals of the part of the Kattegat (the Aalborgbugt) where the plaice of tables B and D were caught, the following will be noted:

Of the valuations in table 1 the series Gjerrild—Hals has been repeated so often, that we get an excellent picture of the influence of the seasons on the quantity of bottom invertebrates in the Aalborgbugt. It is seen that the quantity of worms, being so great in the stomach contents (table B) is pretty constant and comparatively small, perhaps on the very account of the great persecution to which it is subject; the average weight is only ab. 5.2 g. per sq.m. altogether. Only *Pectinaria koreni* may in certain years exhibit a numerous 0-Gr. in the autumn (September 19th, 1923: 150 specimens of the weight of 9.63 g. per sq. m.). What is particularly characteristic of the series Gjerrild—Hals is the enormous quantity of *Spisula subtruncata* of the 0-Gr. which appear at the end of July, and which in the month of September may give weight amounts of up to 81.7 g. per sq. m. (September 15th, 1922); the average weight for the whole year in the series Gjerrild—Hals is 20.3 g. It will be noted that among the many thousands of individuals only 3 specimens were found which, according to their size must be considered as belonging to the I-Gr. The innumerable numbers of the 0-Gr. appearing in the autumn consequently disappears during the winter. I have previously mentioned (Rep. of Dan. Biol. St. XXXI, 1925, p. 36) that the winter cold is the principal cause of the disappearance of these animals, although of course plaice and other rapacious fish consume enormous lots of them. Among the Crustacea special attention is claimed by the abundance of *Ampelisca brevicornis*. Altogether the valuation series Gjerrild—Hals gives an average amount of 1st class plaice food of 31 gr. per sq. m., an extraordinary large quantity of food for the Venus community.

The series S. of Tangen—Hals and Tangen—Læsø Rende, which were only valuated once, show a comparatively small quantity of food, resp. 5.1 and 6.1 g. of 1st class plaice food, most likely because none of them were valuated in the autumn, at which time *Sp. subtruncata* is no doubt abundant here.

Otherwise it will be seen that all the bottom animals frequently appearing in the stomach contents of the plaice (tables B and D) are also numerously represented in the valuation list table 1; there is only one exception from this rule, viz. *Arenicola marina*. The reason of this fact is that the grab in the hard sandy bottom of the *Venus* community often fail to dig out the deepest situated animals. The figures of 1st class plaice food are then minimum figures, so that the area S. of Hals, W. of the line from the Fornæs Light to the western end of Læsø must be described as constantly exhibiting a considerable surplus of 1st Class Plaice Food. In comparison with the 1st class plaice food the quantity of 2nd Class Plaice Food and "Not Plaice Food" is pretty small (ab. 11 g. per sq. m).

Table E shows the results of stomach analyses of 1895 plaice of 2 years and older from the part of the Kattegat situated N. of Hals and W. of the line Fornæs—Læsø—The Skaw Lightship, i.e. the Aalbækbugt and the adjoining waters; the

bottom animals found here chiefly belong to the *Venus* community; only in the branch of the Eastern Channel of the Kattegat cutting down at the Læsø Rende the *Amph. filiformis* community is found. It will at once be noted that the Lamellibranchs here predominate over the Worms; their weight-index figures make out resp. 61.4 % and 31.1 % of the total stomach contents. The species found in the greatest number is *Cultellus pellucidus*, which species alone shows a weight-index of 21 % of the total stomach contents. The frequency, however, is not so great, this species being only found in 22 out of 43 investigations, i.e. in abt. half of the investigations. A far greater frequency is attained by the genus *Nephthys* within the worms, viz. 32, i.e. in three fourths of thein vestigations. After *Cultellus*, *Tellina fabula* and *Spisula subtruncata* of the 0-Gr. are the most important lamellibranchs, the latter form esp. in the months of July—September. Also *Ensis ensis* plays a comparatively prominent part in the nourishment of the plaice in this place. Among the worms the genus *Nephthys* as usual takes up the leading position both in weight and frequency; then follow *Pectinaria koreni*, *Notomastus latericius*, and *Phyllodocidae*, while *Arenicola marina* here, contrary to what was the case S. of Hals, only takes up the fifth place. Of the *Crustacea* the *Amphipod* genus *Ampelisca* and within that the species *Ampelisca brevicornis* is still esteemed highest. It will be noticed that the size of the plaice enables them to consume bigger forms of the Crustacea such as *Portunus* and *Eupagurus*, in fact even small fish as *Ammodytes* and *Gobius minutus*.

The Gastropods make out only a small part of the total stomach contents (2.3 %); most of them are *Philine aperta*. Still smaller is the number of *Echinoderms*; in the solitary places where there have been *Amphiura filiformis* communities the plaice have nibbled off the arm-points of this species.

If tables C and E are compared with tables 2 and 3, which represent the *Venus*- and the *Amph. filiformis*-communities, respectively, of the areas where the plaice of tables C and E were caught, it will be noticed that the quantity of 1st class plaice food in table 2 is considerably small, abt. 10 g. per sq. m. The reason is that all the valuations were carried out so early in the year (in June), that the great numbers of the 0-Gr. of *Spisula subtruncata* had not yet appeared; only in the valuations of June 24th, 1922 there were found 880 very small specimens of the 0-Group per sq. m., but their weight is still inconsiderable. It will further be noticed that neither the number nor the weight of *Cultellus pellucidus*, which was here the chief food of the plaice, is very great, this species being thus especially sought for by the plaice. On the other hand both the number and weight of *Tellina fabula*, which according to tables C and E is of great importance as plaice food, is pretty considerable. That *Nucula*, the lamellibranch species giving the greatest weight per sq. m. in table 2, is only 2nd class plaice food appears from the fact that it plays a very small part in the stomach contents of plaice of both less and more than 2 years of age, esp. of the former; the hard shells make both *Nucula*- and *Venus*-species less esteemed, especially by smaller plaice.

Most numerous and weightiest among the worms is *Nephthys hombergi*, which was also the most important plaice food within the worms; on the other hand *Pectinaria koreni* is completely wanting in table 2 although this species plays a very prominent part in tables C and E; but it holds good also of this species that the great quantity of the year's spat does not appear until the month of July, i. e. after the valuations in table 2 were carried out. While both number and weight of the Echinoderms in table 2 are rather small, the number of the Amphipod species *Ampelisca brevicornis*, which was an important plaice food as shown by tables C and E, is considerable, but the weight pretty small.

From table 3, which represents the bottom animals of the before mentioned rather small area where *Amphiura filiformis* communities are found W. of the line Northern Rønner Light—the Skaw Lightship and N. of Hals, it appears that the worms constitute a pretty considerable quantity of plaice food per sq. m., viz. 17 g. per sq. m. We meet with both *Nephthys hombergi* and *Glycera goësi*, *Notomastus latericius*, *Pectinaria*, and several other forms. In comparison with the worms the lamellibranchs are of less importance as plaice food with respect to weight. On the other hand both number and weight of *Amphiura filiformis* is of course now very great, but, as will be seen by tables C and E, these animals are, in spite of their great number very little sought for by the plaice, i. e. they are 2nd class plaice food. Thus 2nd class plaice food by far exceeds the 1st class plaice food in this community. Of *Crustacea* there are very few.

In table F are put down all the quantitative stomach analyses of plaice from the Kattegat E. of the line Fornæs—Læsø—the Skaw Lightship. All the plaice are here more than 2 years old, many of them 6—8 years old. In the *Venus* communities the worms are the chief food: they amount to 70 % of the total stomach contents. *Nephthys* is still the predominant genus, then follow *Ophiura*, *Ammotrypane*, and *Phyllodocidae*. *Arenicola* has lost its importance altogether. Of the *Lamellibranchs*, which amount to 29.4 % of the total stomach contents, *Cultellus pellucidus* and young *Cyprina islandica* are the most frequent, but besides a lot of different species are devoured, among others several that are 2nd class plaice food, e. g. *Venus gallina*, big *Macoma calcarea*, *Nucula* a. o. *Amphioxus lanceolatus* was on one occasion found here in plaice stomachs.

In the *Echinocardium-Amph. filiformis* communities the worms are still the chief food, and, as in the *Venus* community they amount to 70 % of the weight of the total stomach contents. After *Nephthys* the greatest weight is reached by *Eumenia crassa*, a characteristic animal of this community. After the worms we meet for the first time with *Echinoderms* as No. 2 in weight, *Amphiura filiformis* amounting to no less than 16.2 % of the total stomach contents. The *Lamellibranchs* come as No. 3 with 11.1 %; besides *Cultellus pellucidus* especially 2nd class plaice food is consumed such as big *Mac. calcarea*, *Corbula gibba*, *Venus gallina*, and *Nucula*.

In the *Brissopsis-Amph. Chiajei* communities of the western Kattegat only

very few plaice were caught; here also, however, the worms and after them 2nd class plaice food among the *Lamellibranchs* seem to be the most important food animals.

In the *Haploops* community of the south-eastern Kattegat we have in spite of many attempts not succeeded in catching any plaice, so that we have no stomach investigations from this place.

In tables 4—8 is made up the quantity of plaice food of the different communities E. of the line Fornæs—Læsø—the Skaw Lightship. From table 4 it is seen that while the quantity of 1st class plaice food is pretty small during the spring and the summer months on the *Venus* stations S. of Hals, such a lot of young *Spisula subtruncata* and *Pectinaria koreni* appears in August—September that e. g. in the deeper part of the Aalborgbugt we get figures as 82 g. of 1st class plaice food per sq. m. The quantity of 2nd class plaice food is on an average about 10 g. per sq. m. Thus the conditions of this area fairly well correspond with the *Venus* communities W. of the line (tables 1 and 2). In the *Venus* communities E. of the line, N. of Hals (table 5) no autumn valuations were made. Otherwise they would no doubt show great quantities of young *Spisula subtruncata.* In the month of July the available plaice food chiefly consists of Worms (esp. *Nephthys hombergi*), then of *Lamellibranchs*, particularly many *Tellina fabula.* We notice the big *Ensis ensis* N. of Læsø; it will be remembered that this species is much esteemed as plaice food. In both series of valuations the quantity of 1st class plaice food was about 9 g. per sq. m.: of 2nd class plaice food, which mainly consists of *Ophiura* and thick-shelled lamellibranchs, there was an average of 7 g. per 1 sq. m.

In deeper water with *Amphiura filiformis* communities (table 6) the seasonal variations are only small; no abundance of spat of any of the occurring species appears in late summer. The bulk of 1st class plaice food (64 %) consists of worms, esp. various *Nephthys* species; then follow lamellibranchs, among which *Cultellus pellucidus* plays the prominent part, and finally the Crustacea with *Ampelisca brevicornis* as the most numerous species. The average quantity of 1st class plaice food in this community amounts to 10 g. per sq. m. The quantity of 2nd class plaice food is far greater, primarily on account of the many *Amphiura filiformis*, but moreover there is a good deal of bigger, thick shelled lamellibranchs such as *Macoma calcarea*, *Leda* and *Nucula* species a. o.; the average quantity of 2nd class plaice food amounts to 28 g. per sq. m.

The bottom animals of the deep eastern Kattegat, in the *Brissopsis-Amphiura Chiajei* community, are represented in table 7. Of 1st class plaice food there is a rather considerable quantity (average: about 22 g. per sq. m.); nearly 80 % of it is constituted by worms of different kinds; the greatest weight among the worms, however, is no longer taken up by the *Nephthys* species but by the big forms *Eumenia crassa* and *Aphrodite aculeata.* Of the lamellibranchs the greater part is 2nd class plaice food, big or thick-shelled forms as *Leda*, *Nucula*, and *Modiolaria nigra;* the remainder (apart from big *Cyprina*, which are not devoured by plaice) hardly constitutes 2 g. per sq. m. and is outstripped by the Crustacea, which are very numerous.

Beside *Ampelisca* the species *Haploops tubicola* now plays a prominent part. The 2nd class plaice food mainly consists of *Amphiura* species; next comes the above mentioned big or thick-shelled lamellibranch forms and *Aphrodite aculeata;* altogether it constitutes no less than 27 g. per sq. m.

In the area of the south-eastern Kattegat that is inhabited by the *Haploops* community (table 8), we see for the first time that the bulk of 1st class fish food consists of Crustacea, namely the characteristic animal *Haploops tubicola;* the greatest quantity is reached in late summer when the fry of the year appears. As No. 2 stand the worms: *Maldanidae*, *Eumenia crassa*, and *Nephthys* species; lamellibranchs and gastropods are of less importance here. The bulk of 2nd class plaice food consists of the great polychaetes *Aphrodite aculeata.* The average figures of 1st and 2nd class plaice food are resp. 34 and 15 g. per sq. m., altogether rather high figures.

If the results of the stomach analyses are compared with those of the valuations E. of the line Fornæs—western end of Læsø—N. Rønner Light—the Skaw Lightship, we ascertain as the most characteristic circumstance the fact that the plaice in this area is able to utilize the 2nd class food to a far higher degree than was the case in the area W. of the named line. The reason for this is in the first place that the plaice in the deeper water E. of the line are generally larger specimens than W. of the line, and they are therefore able to consume bigger and more thick-shelled animals; in the second place there are among the bottom animals E. of the line comparatively far greater quantities of 2nd class plaice food than W. of the line; this is above all the case with the *Amphiura* communities. But besides there was in all communities E. of the line found abundant quantities of 1st class plaice food, in the *Venus* communities especially consisting of young *Spisula subtruncata*, in the *Amphiura* communities of worms, and in the Haploops communities of *Haploops tubicola.*

D. The Annual Production of Plaice Food.

With respect to the question about the conditions of nourishment of the plaice E. and W. of the line Fornæs—Læsø—the Skaw it must in the first place be realized that the grab investigations dealt with here as a matter of course are only able to illustrate the quantity of food animals present at the particular time ("the stock of the moment"). What tells us the value of a certain place for the nourishment of the plaice is not, however, the quantity of food present at a certain moment, but how much can be produced during the year. So it will be necessary to consider the valuation material from this point of view.

As stated above the animal communities on the nursery grounds W. of the oft mentioned line nearly exclusively were *Venus* communities, where the plaice food consisted of a greatly varying stock of small lamellibranchs, worms, and Amphipoda. Among the lamellibranchs the most important species were *Spisula subtrun-*

cata, *Cultellus pellucidus*, and *Tellina fabula;* of the first species it has already been said that in the Kattegat it is a biological annual form, so that all that has been found is the production of the same year; the other two species are of a very quick growth, so that the bulk of the demonstrated quantities belongs to the 0-Group, i. e. is the production of the year. The same holds good of several other species of small lamellibranchs: *Tellina tenuis*, *Cardium fasciatum*, the young *Mya truncata* a. o. With respect to most of the polychaetes very little is known of their biology. Of *Pectinaria koreni*, however, we know that it grows very quickly and that the 0-Group often appears in great quantities in late summer; the great quantities of this species found in July—September (table 1) are mainly of the 0-Group, i. e. the year's production. The *Nephthys* species, too, are quick of growth; the bulk of the quantities of this species mentioned in tables 1—3 belong to the 0-Group. Finally it must be taken for granted that the Amphipoda, esp. the most important species *Ampelisca brevicornis* analogously to *Gammarus locusta* (see H. Blegvad: On the Biology of some Danish Gammarids and Mysids, Rep. of Dan. Biol. St. XXVIII, 1921) annually produce several generations of young, so that the annual production of these animals amounts to a weight several times greater than that of the stock of the moment. Further, when it is considered that *Arenicola marina*, as mentioned above, from technical causes has not come out in the bottom samples and that the consumption of the plaice as a matter of course does not appear in the samples, which only indicates the stock in hand at the present moment, it will be seen that the figures of 1st class plaice food found in tables 1 and 2 only indicate a small part of the annual production of plaice food.

In the *Venus* community E. of the line we have the same conditions as described above, but in the *Amphiura filiformis* community and the other communities living on depths of more than 20 m. the thing is quite different. Here the lamellibranchs belonging to the category "1st Class Plaice Food" are at no season present in greater quantities; the main part of the lamellibranchs are slowly growing species, such as *Leda*, *Nucula*, *Cyprina*, *Modiolaria*, *Astarte* a. o. The annual production of these food animals therefore cannot be expected to be very great, possibly hardly so great as the found average weight of the stock. On the other hand many of the polychaetes, among others the *Nephthys* species, are surely species of a quick growth and short life; and the same is the case with the Amphipoda. So we are hardly mistaken when estimating the annual production of 1st class plaice food in the animal communities living on depths of more than 20 m. at about the same as the found quantity of 1st class plaice food in the respective communities. Of 2nd class plaice food, however, which principally comprises the big, slowly growing forms, the annual production is evidently smaller than the stock of the moment.

If we, taking into consideration the bottom areas of the single communities, calculate how much 1st class plaice food is produced annually, when the quantities

of 1st class plaice food stated within each community and part of a community is considered equal to the annual production, we get the following figures for the Kattegat:—

W. of the line:—	1st Class Plaice Food	Area
1. The *Venus* community S. of Hals	41 980 tons	510 sq. miles
2. — — — N. of Hals	8 575 —	250 —
3. The *Amph. filiformis* community N. of Hals .	7 202 —	100 —
Total W. of the line ...	57 757 tons	860 sq. miles
E. of the line:—		
4. The *Venus* community S. of Hals	48 465 tons	785 sq. miles
5. — — — N. of Hals	2 414 —	80 —
6. The *Amph. filiformis* community S. of Hals . .	17 149 —	500 —
7. The *Brissopsis-Amph. Chiajei* community	53 506 —	780 —
8. The *Haploops* community.....	51 311 —	440 —
Total E. of the line...	172 845 tons	2 585 sq. miles

According to the previous these figures must be understood as minimum figures, especially for the part of the *Venus* community where the annual production is likely to be much greater than the stock of the moment. However, if we take the above mentioned figures as the annual production and 18 kg. food animals as necessary for the production of 1 kg. plaice (both figures being rough weight; see C. G. Joh. Petersen in Rep. of Dan. Biol. St. XXV, 1918, p. 36), it will be seen that in the area W. of the line Fornæs—the western end of Læsø—Northern Rønner Light—the Skaw Lightship it is possible to produce at least 3209 tons of plaice annually or more than the total yield of the plaice fishery of the whole Kattegat in 1928 (2600 tons). In the part of the Kattegat situated E. of the line mentioned it should be possible to produce at least 9603 tons of plaice annually. Thus the total of the found minimum figures of the annual production of 1st class plaice food in the Kattegat is sufficient for the production of a weight amount of plaice 6 times the quantity that is at present caught in the Kattegat. Of 2nd class plaice food the found weight amounts are about 64000 and 313000 tons resp. W. and E. of the line. So we see that even with the given minimum figures as a basis of the calculation there is a surplus of both 1st and 2nd class food available for the stock of plaice in the Kattegat[1]).

[1]) No count has been taken here of other animals living partially on the same food as the plaice do. Of such food competitors the most prominent are the dab, the flounder, and the haddock. The quantity of plaice food taken by these fish must, however, be supposed not to exceed ab. 30000 tons annually, or $^1/_{20}$ of the total amount of plaice food found in the Kattegat (the yield of the Danish fishery in the Kattegat of the 3 species mentioned amounted to only 1840 tons in 1928). If the quantity of plaice food taken by the remaining food competitors is estimated to a similar figure, it will be seen that the total consumption of other animals than plaice will reduce the found quantity of plaice food only with $^1/_{10}$.

A protection of the plaice in the area W. of the line Fornæs—the western end of Læsø—Northern Rønner Light—the Skaw Lightship could then by no means create any misgivings in the way of lack of nourishment on account of a possible increase of the density of the plaice stock within the protected area. The annual production of 1st class plaice food is within this very area most likely many times greater than the quantity found at the valuations; so we may suppose that a stock of plaice several times greater than the present one will be able to find suitable and ample nourishment.

We saw above that the quantity of 2nd class plaice food, i.e. the food that can be turned to account only by the greater plaice, increases from the coast and towards the deeper water. It is well known that the plaice as they grow emigrate towards deeper water; but the intense fishery along the coasts of the Kattegat causes that only comparatively few of them get out there. The density of the stock of plaice in the deeper parts of the Kattegat, esp. in the *Amphiura* and *Haploops* communities, is therefore presently so inconsiderable, that the available quantity of food, particularly the 2nd class food, is not fully turned to account, and so we have any reason to believe that the surplus is not altogether utilized productively. Any protection of the areas where the young plaice grow up must be supposed to cause that more grown-up plaice than is now the case are allowed to resort to the rich feeding grounds of the deeper water. As the coastal grounds within the above mentioned line are such pronounced nursery grounds for the young of the plaice, a protection of this area can only mean a step towards a more rational utilisation of the existing plaice food in the Kattegat.

Summary.

In the present paper a series of investigations with the Petersen-Grab in the Kattegat has been compared with the results of quantitative stomach analyses of plaice of various ages from the same place, with special reference to the elucidation of the conditions of nourishment, partly within, partly outside the nursery grounds of the western Kattegat limited by a line Fornæs—the western end of Læsø—Northern Rønner Light—the Skaw Lightship. An account is rendered of a method making it possible to ascertain which food animals are of the greatest importance for the nourishment of the plaice within the single areas (p. 7—8). On the basis of this the bottom animals are classified into 1st Class Plaice Food, 2nd Class Plaice Food, and Not Plaice Food (p. 10—11).

The bottom stages of the plaice of the 0-Group feed during the first months on small Crustacea; about the beginning of September they begin to consume lamellibranchs of the 0-Group (p. 9 and Table A). The chief food of the I-Group is polychaetes, then small lamellibranchs and Crustacea (p. 9; Tables B and C). For the II-Group and older plaice the nourishment was of the following composition:—

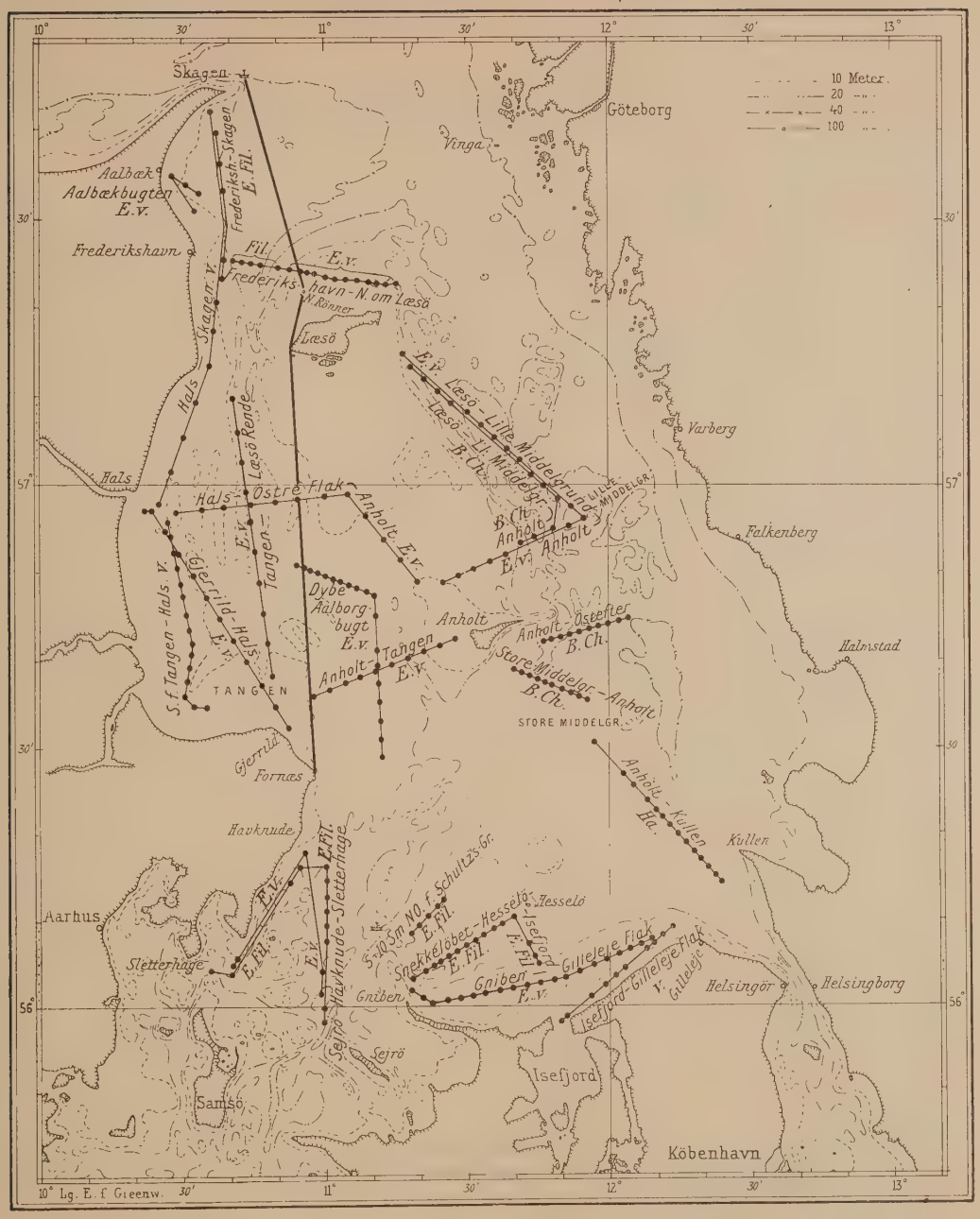
In the *Venus* communities S. of Hals, W. of the above mentioned boundary line Fornæs—Læsø W.—the Skaw: 1) Polychaetes, 2) Molluscs, 3) Crustacea (p. 9—10; Table D); in the same community N. of Hals: 1) Lamellibranchs, 2) Worms, 3) Crustacea (p. 13; Table E). Both in the stomach contents and in the bottom samples *Spisula subtruncata*, *Nephthys*-species (esp. *N. hombergi*), *Arenicola marina*, *Pectinaria koreni*, and *Ampelisca brevicornis* play a prominent part (p. 13; Tables 1 and 2). The found quantity of 1st and 2nd class food in this community appears from Tables 1 and 2.

In a smaller part of the area W. of the line Northern Rønner Light—the Skaw Lightship the bottom animals belong to the *Amph. filiformis* community. Here the polychaetes are the chief food of the plaice (Table 3).

Outside the line Fornæs—the western end of Læsø—Northern Rønner Light—the Skaw Lightship the polychaetes are the chief food of the plaice (p. 14). The bottom samples show that the quantity of 2nd class plaice food (greater molluscs and polychætes, small Echinoderms) increases towards deeper water, this category of food animals being often found in the stomachs of the plaice (p. 15—16). However, also the quantity of 1st class plaice food is rather considerable (Tables 4—8).

The found quantities of 1st class plaice food can be used as minimum figures of the annual production of 1st class plaice food in the Kattegat (p. 17—18). If this production is calculated by the figures found in Tables 1—8, we get an annual production of nourishment of 57757 tons W. of the line Fornæs—the western end of Læsø—Northern Rønner Light—the Skaw Lightship, and 172845 tons (both figures rough weight) E. of the same line; these quantities are considered sufficient for the production of resp. 3209 and 9603 tons of plaice annually. The found quantities of 2nd class plaice food amounted to 64000 and 313000 tons resp. W. and E. of the line. As the total yield of the plaice fishery in the Kattegat amounted only to 2600 tons in 1928, the found figures seem to suggest a surplus of both 1st and 2nd class plaice food in the Kattegat (p. 18).

A protection of the area W. of the line Fornæs—the western end of Læsø—Northern Rønner Light—the Skaw Lightship must be supposed to cause a more intense utilisation of the available quantity of food, the surplus of which obviously is not utilized productively at present (p. 19).



Valuation Series in the Kattegat, 1919—1926.

Tabel 1. Venus-Sa

Syd for Hals, Vest for Linien Fornæs—Vesten

Table 1. Venus-C

South of Hals, West of the Line Fornæs—Western

Farvand / *Valuation Series*	Gjerrild—Hal									
Aar / *Year*	1919		1922		1924		1921		1925	
Dato / *Date*	14/6		15/6		6/7		26/7		9/9	
Antal Prøver à 0.1 m² / *No. of samples of 0.1 sq. m.*	16		22		20		24		22	
A. = Antal pr. m²; V. = Raavægt i g pr. 1 m² / *No. per sq. m.; Rough weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.	A.	
Syndosmya (Abra) alba (Wood)	0.6	0.06	0.5	0.05	1.0	0.05	0.4	0.04	0.9	0
Macoma calcarea (Cheuv.)	0.6	0.06	..	..	4.0	0.05	..	..	2.7	0
Tellina fabula Grow.	1.9	0.13	6.4	0.09	7.5	0.25	4.6	0.13	19.5	0
— tenuis D. C.	..	..	0.9	0.05	..	..	2.9	0.04	1.4	0
Mya truncata L. juv. (* sp.)	0.6	0.06	..	..	2.5	0.05	2.1	0.08	..	
Corbula gibba Olivi	..	..	1.4	0.05	..	..	2.9	0.13	..	
Thracia fragilis (Penn.)	..	..	0.9	0.05	..	..	..	..	..	
Cultellus pellucidus (Penn.)	0.6	0.44	0.5	0.09	..	..	6.6	0.37	34.1	0
Ensis ensis (L.)	..	..	..	..	..	..	..	..	4.1	0
Spisula subtruncata (D. C.)	..	..	..	..	..	..	..	..	1.4	1
— — 0-gr.	..	..	3.6	0.09	..	..	180.0	8.96	785.0	40
Mactra stultorum L. 0-gr.	..	..	..	..	..	..	..	..	0.9	0
Venus (Chione) gallina (L.)	2.5	1.13	7.3	3.36	13.0	0.30	4.2	1.25	11.4	1
Cyprina islandica L. juv.	2.5	0.13	1.4	0.09	..	..	..	..	..	
Cardium fasciatum Mtg.	..	..	..	..	..	..	..	..	..	
Axinus flexuosus (Mtg.)	..	..	0.5	0.05	..	..	..	..	..	
Montacuta ferruginosa (Mtg.)	..	..	..	..	..	..	..	..	2.7	0
— bidentata (Mtg.)	..	..	..	..	..	..	..	..	..	
Nucula nitida Sowb.	..	..	0.9	0.09	0.5	0.05	..	..	..	
Modiolaria discors L. juv.	..	..	0.5	0.05	0.5	0.05	..	..	..	
Buccinum undatum L.	..	..	1.4	8.50	..	..	..	..	..	
Nassa reticulata L. 0-gr.	..	..	..	..	..	..	..	..	0.9	0
— pygmæa Lam.	..	..	0.9	0.05	..	..	..	..	..	
Natica nitida Donov.	..	..	..	..	..	..	0.4	0.04	1.8	0
Bela turricula Mtg.	1.3	0.25	1.8	0.50	..	..	1.3	0.25	0.5	0
Aporrhais pes pelecani L. juv.	..	..	..	..	..	..	..	..	..	
Lacuna divaricata Fabr.	..	..	0.5	0.05	..	..	0.4	0.04	..	
Rissoa membranacea Adams f. octona	..	..	..	..	..	..	..	..	..	
— violacea Desm.	..	..	..	..	..	..	..	..	6.4	0
Philine aperta L.	6.3	2.81	4.1	0.77	2.5	0.15	3.3	0.21	8.6	4
Acera bullata Müll.	..	..	..	..	..	..	..	..	0.5	0
Polycera quadrilineata Müll.	..	..	0.5	0.05	..	..	..	..	..	
Harmothoë imbricata L.	..	..	0.5	0.05	..	..	..	..	0.9	0
— sarsi Mgr.	..	..	..	..	1.0	0.05	..	..	..	
Phyllodocidæ	0.6	0.06	0.5	0.09	0.5	0.10	0.8	0.21	..	
Phyllodoce maculata L.	..	..	..	..	..	..	..	..	..	
Nephthys hombergi Aud. & Edw.	6.3	1.44	12.7	1.05	10.0	1.30	16.3	1.50	5.5	0
— longosetosa Ørst			6.4	1.00	2.5	0.30			2.7	0
— ciliata O. F. M.			..	..	..	..			0.5	0
Nereis pelagica L.	1.9	0.25	0.5	0.18	..	..	..	..	..	
Glycera sp.	..	..	..	..	..	..	..	..	0.9	0
Spionidæ	..	..	..	..	55.0	0.25	∞	0.13	..	
Scoloplos armiger (O. F. M.)	0.6	0.06	5.0	0.23	8.0	0.20	15.0	0.33	10.0	0
Ophelia limacina Rthke	..	..	2.3	0.09	7.0	0.25	7.9	0.42	6.4	0
Ammotrypane aulogaster Rthke	0.6	0.06	..	..	0.5	0.15	..	..	0.5	0

± Echinocardium.

æsø—Nordre Rønner Fyr—Skagens Fyrskib.

ity ± Echinocardium.

sø—Nordre Rønner Light—The Skaw Lightship.

						S. f. Tangen-Hals		Tangen-Læsø Rende		Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food* per 1 m²	2. Kl. Rødspætteføde *2nd Class Plaice Food* per 1 m²	Ikke Rødspætteføde *Not Plaice Food* per 1 m²
922		1923		1920		1925		1925						
$^{15}/_{9}$		$^{19}/_{9}$		$^{13}/_{9}$ & $^{21}/_{9}$		$^{15-16}/_{5}$		$^{6}/_{6}$						
22		8		15		30		10						
	V.	A.	V.	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
9	0.09	..	..	..	..	..	..	..	..	0.4	0.04		..	..
5	0.05	..	..	..	..	..	..	7.0	0.30	1.5	0.05		..	..
2	0.45	7.5	0.25	2.0	0.20	2.7	0.17	18.0	1.10	8.8	0.29		..	..
	..	1.3	0.13	0.7	0.07	..	..	..	..	0.7	0.03		..	..
9	0.09	2.5	0.13	..	..	..	..	*7.0	0.10	1.6	0.05		..	..
5	0.05	..	..	8.7	0.13	..	..	..	..	1.4	0.04		..	..
	..	..	..	..	..	..	..	..	..	0.1	0.01	14.91	..	..
9	0.19	5.0	0.25	2.0	0.20	2.3	0.17	5.0	1.20	5.8	0.36		..	..
	..	1.3	0.25	..	..	..	..	1.0	0.20	0.6	0.06		..	..
	..	..	..	..	..	..	..	..	..	0.1	0.12		..	..
3	81.73	17.5	1.88	84.7	4.93	1.3	0.03	3.0	0.10	468.2	13.84		..	..
	..	..	..	..	..	..	..	..	..	0.1	0.02		..	..
	..	2.5	0.88	2.7	3.80	2.0	1.43	6.0	1.00	5.2	1.48	..	1.48	..
	..	..	..	0.7	0.07	..	..	2.0	0.10	0.7	0.04		..	..
5	0.05	5.0	0.13	..	..	1.0	0.07	..	..	0.7	0.03		..	..
	..	..	..	..	..		..	..	..	0.1	0.01	0.12	..	..
	..	..	..	0.7	0.03	..	..	4.0	0.20	0.7	0.03		..	..
	..	..	..	0.7	0.03	1.0	0.03	..	..	0.2	0.01		..	..
4	0.14	..	..	..	..	..	..	16.0	1.80	1.9	0.21	..	0.21	..
	..	..	..	..	..	..	..	..	..	0.1	0.01	0.01	..	..
9	2.09	..	..	..	..	..	..	..	..	0.2	1.06	..	..	1.08
	..	..	..	..	..	..	..	..	..	0.1	0.01	..	..	
	..	..	..	..	..	..	..	..	..	0.1	0.01	..	..	
	..	..	..	0.7	0.07	..	..	..	..	0.3	0.02	0.15	..	..
	..	1.3	0.13	0.7	0.07	..	..	..	..	0.7	0.13		..	..
9	0.45	..	..	..	..	..	..	..	..	0.1	0.05	..	0.05	..
2	0.23	2.5	0.13	..	..	..	..	..	..	0.7	0.05		..	..
2		..	..	..	..	..	..	..	..	0.3	0.06		..	..
3	0.27	13.8	0.25	..	..	..	..	..	..	2.9		1.21	..	..
0	1.55	..	..	4.7	0.27	8.7	0.33	..	..	4.3	1.05		..	..
	..	..	..	3.3	0.13	1.0	0.10	..	..	0.5	0.03		..	..
	..	1.3	0.13	..	..	0.3	0.03	..	..	0.2	0.02		..	..
9	0.09	1.3	0.13	0.7	0.07	..	..	..	..	0.5	0.04		..	..
	..	..	..			..	..	..	..				..	..
	..	..	..	2.0	0.33	0.7	0.03	..	..	0.5	0.08		..	..
	..	..	..	..	..	..	..	1.0	0.10	0.1	0.01		..	..
4	0.72	1.3	0.13			7.0	0.70	16.0	0.80				..	..
2	0.46	3.7	1.25	10.7	1.40	..	..	1.0	0.10	12.1	1.32		..	..
	..	..	..			..	..	..	..			2.13	..	..
	..	..	..	..	..	..	..	..	..	0.2	0.04		..	..
	..	..	..	..	..	..	..	..	..	0.1	0.02		..	..
	..	62.5	0.50	..	..	..	..	..	..	11.7+	0.09		..	..
2	0.09	3.8	0.25	18.0	0.53	10.0	0.33	29.0	0.50	10.3	0.27		..	..
9	0.14	3.8	0.13	8.0	0.60	5.7	0.13	6.0	0.10	4.8	0.21		..	..
4	0.23	..	..	..	..	..	..	..	..	0.3	0.05		..	..

Tabel 1 (fortsat)

Farvand / *Valuation Series*	Gjerrild—Hals									
Aar / *Year*	1919		1922		1924		1921		1925	
Dato / *Date*	14/6		15/6		6/7		26/7		9/9	
Antal Prøver à 0.1 m² / *No. of samples of 0.1 sq. m.*	16		22		20		24		22	
A. = Antal pr. m²; V. = Raavægt i g pr. 1 m² / *No. per sq. m.* — *Rough weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.	A.	V.
Travisia forbesi Rthke	..	..	..	..	..	..	1.7	0.17	0.5	0.05
Pectinaria koreni Mgrn.	5.0	0.75	..	..	1.0	0.10	28.3	1.54	18.6	2.32
Amphicteis gunneri (Sars)	..	..	..	..	..	..	..	..	..	..
Terebellidæ	..	..	..	..	..	..	..	..	..	..
Nemertini	0.6	0.13	1.4	0.14	..	..	1.7	0.21	1.4	0.09
Planaria sp.	..	..	0.5	0.05	..	..	1.3	0.13	1.4	0.14
Ophiura albida Forb.	15.0	2.69	9.5	2.73	8.0	1.35	12.9	3 21	17.7	4.37
— affinis Ltk.	..	..	..	..	1.0	0.05	..	..	8.2	0.14
Asterias rubens L.	1 3	15.94	0.5	0.45	2.0	0.30	..	..	0.9	0.45
Echinocardium cordatum (Penn.)	3.1	6.00	6.8	9.55	..	..	0.4	0.46	..	..
— — juv.	..	..	..	..	..	..	11.3	0.50	130.0	56.00
Echinocyamus pusillus (O. F. M.)	0.6	0.06	0.5	0.05	4.0	0.15	..	..	1.4	0.14
Psammechinus miliaris (Gmel.)	..	..	..	..	..	..	..	..	..	..
Hippomedon denticulatus (Sp. Bate)	..	..	..		..		0 4		0 5	0 05
Ampelisca brevicornis (Costa)	96 9	3.00	105.5		49.0		684.6		486.4	3.77
Pontoporeia femorata Kr.	..	..	0.9		0.5		1.3		1.4	0.09
Bathyporeia pelagica (Sp. Bate)	..	..	..		0.5		..		2.3	0.05
— guilliamsoniana (Bate)	..	..	..	2.14	..	0.85	..	4.17	..	..
Phoxocephalus holbølli (Kr.)	..	..	..		..		..		..	..
Nototropis swammerdami (M.-Edw.)	..	..	..		..		..		..	..
Dexamine spinosa (Mont.)	..	..	..		..		..		1.4	
Gammarellus homari (I. C. Fabr.)	..	..	0.5		3.0		1.7		..	0.05
Melita obtusata (Mont.)	..	..	..	..	..		..	..	..	
Microdeutopus gryllotalpa Costa	..	..	..	..	..		..	..	0.9	
Amphithoë rubricata (Mont.)	1.3	0.19	..	..	..		..	..	..	..
Ischyrocerus angvipes Kr.	..	..	..	..	2.0		..	..	..	..
Caprella septentrionalis Kr.	0.6	0.06	..	..	1.5	0.05	..	..	..	..
Idothea baltica (Pallas)	1.3	0.25	0.5	0.05	2.0	0.15	1.3	0.08	0.5	0.05
Diastylis rathkei Kr.	..	..	0.9	0.05	2.5	0.15	1.7	0.13	1.4	0.09
— spinosa Norman	..	..	0.5		1.5		4.2		5.5	0.18
Lamprops fasciata G. O. Sars	..	..	..	..	1.5	0.05	..	..	..	..
Gastrosaccus spinifer Goës	..	..	..	..	2.5	0.10	1.3	0.04	0.5	0.05
Mysis flexuosa (O. F. M.)	..	..	..	..	..	..	..	..	..	..
Eupagurus bernhardus L.	..	..	..	..	..	..	..	..	..	..
Spirontocharis gaimardi M.-Edw.	..	..	..	..	..	..	..	..	..	..
Actiniidæ	..	..	..	..	..	..	..	..	..	..
Ascidiæ	..	..	..	..	0.5	0.05	0.8	0.08	..	..
Amphioxus lanceolatus Pall.	..	..	0.9	0.14	..	..	..	..	..	..
Cyclopterus lumpus L. juv.	..	..	..	..	0.5	0.05	..	..	..	..
I alt / *Total*	36.01 g		32.07 g		6.95 g		24.85 g		119.62 g	
1. Kl Rødspættefoede / *1st Class Plaice Food*	10.19 -		7.24 -		4.70 -		19.37 -		55.78 -	
2. Kl. Rødspættefoede / *2nd Class Plaice Food*	3.88 -		6.23 -		1.90 -		4.96 -		63.34 -	
Ikke Rødspættefoede / *Not Plaice Food*	21.94 -		18.60 -		0.35 -		0.52 -		0.50 -	

le 1 (continued).

						S. f. Tangen-Hals		Tangen-Læsø Rende		Total Gennemsnit *Total Average* pr. 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food* per 1 m²	2. Kl. Rødspætteføde *2nd Class Plaice Food* per 1 m²	Ikke Rødspætteføde *Not Plaice Food* per 1 m²
1922		1923		1920		1925		1925						
$^{15}/_{9}$		$^{19}/_{9}$		$^{13}/_{9}$ & $^{21}/_{9}$		$^{15-16}/_{5}$		$^{6}/_{6}$						
15		8		22		30		10						
	V.	A.	V.	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
5	0.09	..	..	..	..	..	..	..	..	0.3	0.03		..	..
4	9.00	150.0	9.63	43.3	4.80	1.0	0.17	..	..	31.9	2.83		..	..
	..	..	..	..	..	0.3	0.07	..	..	0.2	0.01	3.08	..	..
4	0.05	..	..	..	..	..	..	..	..				..	..
6	0.18	1.3	0.13	4.0	0.33	1.0	0.13	..	..	1.5	0.13		..	..
4	0.23	..	..	1.3	0.13	0.7	0.10	..	..	0.7	0.08		..	..
2	2.91	7.5	2.88	15.3	3.47	35.3	4.20	21.0	4.60	15.5	3.24	..	3.32	..
2	0.23	8.8	0.25	..	..	1.0	0.03	1.0	0.10	2.8	0.08	..		..
5	5.23	..	..	0.7	0.13	1.3	2.57	..	..	0.7	2.51	..	..	9.72
4	6.55	3.8	27.50	..	..	..	..	2.0	22.00	1.8	7.21	..	..	
	..	2.5	1.75	..	..	0.3	0.07	..	..	14.4	5.83	..	5.92	..
5	0.05	..	..	1.3	0.13	1.0	0.10	3.0	0.20	1.2	0.09	..		..
	..	..	..	..	..	1.7	5.33	..	..	0.2	0.53	..	..	0.53
	..	..	..	..	..	..	..	1.0		0.2			..	..
0		33.8	0.50	98.7	1.00	73.0		29.0		171.7			..	..
5		..	..	..	..	..		..		0.8			..	..
		..	..	..	..	4.3		27.0		3.4			..	..
		..	..	..	..	0.3		1.0		0.1			..	..
	0.68	..	..	..	..	0.7		5.0	0.90	0.6			..	..
		..	..	..	..	6.7	1.83	..		0.7	1.93		..	..
5		..	..	..	..	0.3		..		0.2			..	..
5		..	..	..	..	0.3		..		0.6			..	..
	..	..	..	..	..	..		7.0		0.7		2.25	..	..
	..	..	..	..	..	..		..	..	0.1			..	..
	..	..	..	..	..	0.7		..	..	0.2			..	..
	..	..	..	..	..	..	..	..	..	0.2			..	..
	..	..	..	..	..	..	..	..	..	0.2	0.01		..	..
9	0.18	2.5	0.25	0.7	0.07	2.3	0.17	..	..	1.2	0.13		..	..
	..	..	..	..	..	1.7	0.07	1.0	0.10	0.9	0.11		..	..
4	0.09	..	..	..	..	12.7	0.33	1.0	0.10	2.7			..	..
	..	..	..	..	..	0.3	0.03	1.0	0.10	0.3	0.02		..	..
9	0.05	1.3	0.13	1.3	0.07	..	..	..	..	0.8	0.04		..	..
	..	..	..	..	..	0.3	0.03	..	..	0.1	0.01		..	..
	..	..	..	..	..	0.3	0.03	..	..	0.1	0.01	..	0.01	..
	..	..	..	..	..	0.3	0.07	..	..	0.1	0.01	0.01	..	..
	..	..	..	2.0	0.20	..	..	1.0	0.10	0.3	0.03	..	..	0.03
	..	..	..	..	..	0.3	0.03	..	..	0.2	0.02	..	..	0.02
	..	..	..	..	..	..	..	..	..	0.1	0.01	0.01	..	..
	..	..	..	..	..	..	..	..	..	0.1	0.01	0.01	..	..
4.68 g		49.95 g		23.26 g		18.91 g		35.90 g		46.26 g		23.89	10.99	11.38
7.03 -		16.69 -		15.53 -		5.12 -		6.10 -		23.89 -				
3.78 -		5.76 -		7.40 -		5.86 -		7.70 -		10.99 -				
3.87 -		27.50 -		0.33 -		7.93 -		22.10 -		11.38 -				

Tabel 2. Venus-Samfund ± Echinocardium.

Nord for Hals, Vest for Linien Fornæs—Vestenden af Læsø—Nordre Rønner Fyr—Skagens Fyrskib.

Table 2. Venus-Community ± Echinocardium.

North of Hals, West of the Line Fornæs—Western End of Læsø—Nordre Rønner Light—The Skaw Lightship.

Farvand / *Valuation Series*	Hals—Skagen				Aalbækbugt						Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspættefode *1st Class Plaice Food*	2. Kl. Rødspættefode *2nd Class Plaice Food*	Ikke Rødspættefode *Not Plaice Food*
Aar / *Year*	1922		1923		1922		1923		1925						
Dato / *Date*	24/6		28/6		26/6		23/6		8/6						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	16		14		8		8		8				per 1 m²	per 1 m²	per 1 m
A = Antal pr. m²; V = Raavægt i g pr. m² / A = *Number per sq. m.* V = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
Syndosmya (Abra) alba (Wood) 0-gr.	0.6	0.06	..	..	..	..	..	..	2.5	0.02	0.6	0.02		..	..
— — prismatica (Mtg.)	..	..	..	..	1.3	0.13	..	..	1.3	0.13	0.6	0.06		..	..
Macoma calcarea (Chem.) juv.	0.6	0.06	..	..	2.5	0.25	..	..	1.3	0.13	0.9	0.09		..	..
Tellina fabula Gron.	38.8	0.50	6.4	0.14	67.5	6.75	20.0	1.88	46.3	1.88	35.8	2.23		..	..
Mya sp. juv.	9.4	0.25	..	..	..	..	..	..	..	..	1.9	0.05	3.91	..	..
Corbula gibba Olivi.	25.0	1.88	2.1	0.21	..	..	..	..	..	..	5.4	0.42		..	..
Cultellus pellucidus (Penn.)	..	..	..	..	5.0	1.75	..	..	1.3	0.13	1.3	0.38		..	..
Ensis ensis (L.)	..	..	..	..	..	..	..	..	2.5	0.25	0.5	0.05		..	..
Spisula subtruncata (D. C.) juv.	880.0	2.69	..	..	5.0	0.25	..	..	2.5	0.13	177.5	0.61		..	..
Venus (Chione) gallina (L.)	5.0	4.69	2.1	0.07	3.8	0.12	50.0	1.25	1.1	0.13	12.4	1.25	..	1.25	..
Cyprina islandica L. juv.	..	..	2.1	0.07	..	..	..	..	1.3	0.13	0.7	0.04		..	..
Cardium fasciatum Mtg.	..	..	0.7	0.07	..	..	..	..	..	..	0.1	0.01		..	..
Montacuta ferruginosa (Mtg.)	..	..	1.4	0.07	..	..	..	..	1.2	0.05	0.5	0.02	0.15	..	..
— bidentata (Mtg.)	0.6	0.06	..	..	10.0	0.13	..	..	8.8	0.20	3.9	0.08		..	..
Nucula nitida Sowb.	1.9	0.31	2.1	0.07	47.5	7.75	36.3	2.88	76.3	7.25	32.8	3.65	..		..
— tenuis (Mtg.)	..	..	..	..	..	..	1.3	0.06	..	..	0.3	0.01	..	3.66	..
Buccinum undatum L.	..	..	0.7	2.50	..	..	..	..	..	..	0.1	0.50	..	..	
Nassa reticulata L.	1.3	0.25	..	..	..	..	..	..	..	..	0.3	0.05	..	..	0.60
— pygmæa Lam.	..	..	..	..	..	..	1.3	0.25	..	..	0.3	0.05	..	..	
Natica catena Da Costa	1.3	0.19	..	..	2.5	1.50	..	..	2.5	0.25	1.3	0.39		..	..
— nitida Donov.	..	..	..	..	2.5	1.25	..	..	..	..	0.5	0.25		..	..
Bela turricula Mtg.	..	..	0.7	0.07	..	..	1.3	0.25	2.5	0.38	0.9	0.14	0.87	..	..
Lacuna divaricata Fabr.	..	..	7.1	0.29	..	..	..	..	..	..	1.4	0.06		..	..
Rissoa violacea Desm.	1.3	0.06	0.7	0.07	..	..	..	..	..	..	0.4	0.03		..	..
Turritella terebra L.	..	..	..	..	..	..	..	..	1.3	0.50	0.3	0.10	..	..	0.10
Philine aperta L.	6.9	0.38	2.1	0.21	1.2	0.12	..	..	15.0	6.13	5.0	1.39	1.39	..	..
Harmothoë imbricata L.	..	..	1.4	0.29	..	..	..	..	..	..	0.3	0.06		..	..
Sigalion mathildæ Aud. & Edw.	..	..	..	..	1.3	0.25	1.3	0.25	..	..	0.5	0.10		..	..
Phyllodocidæ	0.6	0.19	..	..	..	..	..	..	..	..	0.1	0.04		..	..
Phyllodoce maculata L.	..	..	4.3	1.79	..	..	2.5	0.38	..	..	1.4	0.43	2.33	..	..
Scoloplos armiger (O. F. M.)	8.1	0.13	2.1	0.07	1.2	0.13	..	..	16.3	0.25	5.5	0.12		..	..
Nephthys hombergi Aud. & Edw.	13.1	0.75	10.0	0.79	21.3	2.00	11.3	1.00	21.3	3.50	15.4	1.61		..	..

Tabel 2 (fortsat). Table 2 (continued).

Farvand / *Valuation Series*	Hals—Skagen				Aalbækbugt						Total Gennemsnit *Total Average* pr. 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food*	2. Kl. Rødspætteføde *2nd Class Plaice Food*	Ikke Rødspætteføde *Not Plaice Food*
Aar / *Year*	1922		1923		1922		1923		1925						
Dato / *Date*	24/6		23/6		26/6		23/6		3/6						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	16		14		8		8		8				per 1 m²	per 1 m²	per 1 m²
A = Antal pr. m²; V = Raavægt i g pr. m² / A = *Number per sq. m.* V = *Rough Weight in g per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
Nephthys longosetosa Ørst	1.3	0.31	1.4	0.14	..	..	..	..	..	..	0.5	0.09	0.70	..	..
Ophelia limacina Rthke	1.3	0.06	5.7	0.29	..	..	..	..	..	..	1.4	0.07		..	..
Nemertini	1.3	0.06	..	..	1.2	0.25	..	..	3.8	1.75	1.3	0.41		..	..
Planaria sp.	..	..	1.4	0.14	..	..	2.5	0.50	..	..	0.8	0.13		..	..
Amphiura chiajei Forb.	..	..	..	..	..	..	..	..	1.3	0.50	0.3	0.10	..	1.05	..
— filiformis (O. F. M.)	..	..	..	..	..	..	..	..	2.5	0.25	0.5	0.05	..		..
Ophiura albida Forb.	3.1	0.06	2.1	0.57	8.8	1.88	2.5	1.25	2.5	0.75	3.8	0.90	..		..
Asterias rubens L.	..	..	0.7	3.00	..	..	..	..	1.3	11.00	0.4	2.80	..	..	9.05
Echinocardium cordatum (Penn.)	..	..	..	..	..	..	1.3	2.50	2.5	28.50	0.8	6.25	..	..	
— — juv.	..	..	..	..	2.5	0.75	..	..	..	..	0.5	0.15	..	0.23	..
Echinocyamus pusillus (O. F. M.)	0.6	0.06	2.1	0.36	..	..	..	..	..	..	0.5	0.08	..		..
Psammechinus miliaris (Gmel.)	0.6	0.31	..	..	..	..	..	..	..	..	0.1	0.06	..	..	0.12
Phyllophorus pellucidus (Flem.)	0.6	0.31	..	..	..	..	..	..	..	..	0.1	0.06	..	..	
Hippomedon denticulatus (Sp. Bate)	0.6		..	..	..	..	..	..	..	..	0.1			..	..
Ampelisca brevicornis (Costa)	136.3		39.3		8.8	0.37	23.8	0.88	8.8		43.4			..	..
Bathyporeia guilliamsoniana (Bate)	..		0.7		..	..	..	..	..	0.38	0.1			..	..
Phoxocephalus holbølli (Kr.)	..	2.94	0.7	1.14	..	..	..	..	1.3		0.4	1.14		..	..
Dexamine spinosa (Mont.)	..		0.7		..	..	..	..	..	..	0.1			..	..
Gammarellus homari (I. C. Fabr.)	2.5		4.3		..	..	..	..	..	..	1.4		1.30	..	..
Ischyrocerus angvipes Kr.	0.6		..	..	..	..	..	..	..	..	0.1			..	..
Idothea baltica (Pallas)	0.6	0.06	..	..	..	..	..	..	..	..	0.1	0.01		..	..
Diastylis rathkei Kr.	3.2		2.1	0.07	..	..	..	..	..	..	1.1			..	..
— spinosa Norman	0.6	0.13	..	..	..	..	..	..	1.3	0.13	0.4	0.07		..	..
Portunus depurator L.	0.6	0.38	..	..	..	..	..	..	..	..	0.1	0.08		..	..
Hydroidæ	..	..	1.4	0.07	..	..	..	..	..	..	0.3	0.01	..	0.01	..
Edwardsia chrysanthellum (Leach)	..	..	..	..	2.5	0.12	..	..	..	..	0.5	0.02	0.02	..	..
I alt / *Total*	17.13 g		12.56 g		25.75 g		13.33 g		64.95 g		26.77 g		10.70	6.20	9.87
1. Kl. Rødspætteføde *1st Class Plaice Food*	11.14 -		5.92 -		15.25 -		5.14 -		15.82 -		10.70 -		..	..	..
2. Kl. Rødspætteføde *2nd Class Plaice Food*	5.12 -		1.14 -		10.50 -		5.44 -		8.88 -		6.20 -		..	..	..
Ikke Rødspætteføde *Not Plaice Food*	0.87 -		5.50 -		..		2.75 -		40.25 -		9.87 -		..	..	..

Tabel 3. Amphiura filiformis-Samfund ± Echinocardium.

Nord for Hals, Vest for Linien Fornæs—Vestenden af Læsø—Nordre Rønner Fyr—Skagens Fyrskib.

Table 3. Amphiura filiformis-Community ± Echinocardium.

North of Hals, West of the Line Fornæs—Western End of Læsø—Nordre Rønner Light—The Skaw Lightship.

Farvande / *Valuation Series*	Frederikshavn—Skagen		Frederikshavn—N. om Læsø		Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food*	2. Kl. Rødspætteføde *2nd Class Plaice Food*	Ikke Rødspætteføde *Not Plaice Food*
Aar / *Year*	1922		1926						
Dato / *Date*	24/6		5/7						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	10		5				per 1 m²	per 1 m²	per 1 m²
A = Antal pr. m²; V = Raavægt i g pr. 1 m² / A = *Number per sq. m.* V = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	V.	V.	V.
Syndosmya (Abra) alba (Wood)	1	0.3	..	..	0.5	0.15		..	..
— — nitida (Müll.)	1	0.1	..	..	0.5	0.05		..	..
Tellina fabula Gron.	2	0.2	..	..	1.0	0.10	2.15	..	..
Cultellus pelucidus (Penn.)	10	2.0	8	1.6	9.0	1.80		..	..
Spisula subtruncata (D. C.) juv.	5	0.1	..	..	2.5	0.05		..	..
Cardium echinatum L.	1	2.0	..	..	0.5	1.00	..	..	1.00
Axinus flexuosus (Mtg.)	3	0.1	4	0.2	3.5	0.15		..	..
Montacuta ferruginosa (Mtg.)	3	0.1	..	..	1.5	0.05	0.55	..	..
— bidentata (Mtg.)	109	0.5	30	0.2	69.5	0.35		..	..
Nucula nitida Sowb.	103	5.0	..	..	51.5	2.50	..	2.60	..
— tenuis (Mtg.)	1	0.2	..	..	0.5	0.10	..		..
Natica nitida Donov.	2	0.1	..	..	1.0	0.05	0.05	..	..
Aporrhais pes pelecani L.	1	4.2	..	..	0.5	2.10	..	..	4.20
Turritella terebra L.	6	3.2	6	1.0	6.0	2.10	..	..	
Cylichna cylindracea Penn.	7	0.3	..	..	3.5	0.15	1.15	..	..
Philine aperta L.	11	0.2	4	1.8	7.5	1.00		..	..
Chætoderma nitidulum Lovén	..	..	2	0.2	1.0	0.10	0.10	..	..
Pholoë minuta Fabr.	1	0.1	..	..	0.5	0.05		..	..
Nephthys hombergi Aud. & Edw.	19	3.1	..	..	9.5	1.55		..	..
Glycera Goësi Mgr.	..	..	14	8.2	7.0	4.10		..	..
Scoloplos armiger (O. F. M.)	1	0.1	2	0.4	1.5	0.25		..	..
Cirratulus tentaculatus Mont.	4	0.2	..	..	2.0	0.10		..	..
— cirratus Müll.	..	..	2	0.4	1.0	0.20	10.60	..	..
Ammotrypane aulogaster Rthke	1	0.4	..	..	0.5	0.20		..	..
Brada villosa (Rthke)	..	..	2	0.4	1.0	0.20		..	..
Eumenia crassa Ørst.	..	..	2	2.4	1.0	1.20		..	..
Scalibregma inflatum Rthke	2	0.1	..	..	1.0	0.05		..	..
Notomastus latericius Sars	12	2.8	16	2.6	14.0	2.70		..	..

Tabel 3 (fortsat). Table 3 (continued).

Farvande / *Valuation Series*	Frederikshavn—Skagen		Frederikshavn—N. om Læsø		Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food*	2. Kl. Rødspætteføde *2nd Class Plaice Food*	Ikke Rødspætteføde *Not Plaice Food*
Aar / *Year*	1922		1926						
Dato / *Date*	24/6		5/7						
Antal Prøver à 0.1 m² / *No. Samples of 0.1 sq. m.*	10		5				per 1 m²	per 1 m²	per 1 m²
A = Anta pr. m²; V = Raavægt i g pr. 1 m² / A = *Number per sq. m.* V = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	V.	V.	V.
Owenia fusiformis D. Chi.	..	..	2	0.2	1.0	0.10		..	..
Maldanidæ	..	..	6	2.0	3.0	1.00		..	..
Pectinaria auricoma O. F. M.	4	0.5	..	..	2.0	0.25		..	..
— koreni Mgrn.	..	..	2	0.6	1.0	0.30		..	..
— belgica Pall.	..	..	4	7.6	2.0	3.80		..	..
Terebellidæ	1	0.1	..	..	0.5	0.05	6.65	..	..
Pista cristata (Müll.)	..	..	2	0.6	1.0	0.30		..	..
Phascolosoma glaciale (Dan. & Kor.)	..	..	2	0.6	1.0	0.30		..	..
— margaritaceum Sars	..	..	2		1.0			..	..
Nemertini	3	0.6	2	0.2	2.5	0.40		..	..
Planaria sp.	2	0.3	..	..	1.0	0.15		..	..
Amphiura chiajei Forb.	2	0.7	110	28.0	56.0	14.35	..	107.15	..
— filiformis (O. F. M.)	227	81.5	528	102.4	377.5	91.95	..		..
Ophiura albida Forb.	11	1.5	2	0.2	6.5	0.85	..		..
Echinocardium cordatum (Penn.)	15	154.7	..	..	7.5	77.35	..	..	77.35
Amphipoda	2	0.1	..	..	1.0	0.05	0.30	..	..
Ampelisca sp.	..	..	2	0.2	1.0	0.10		..	..
Diastylis spinosa Norman	1	0.05	..	..	0.5	0.025		..	..
— rostrata Goodsir	..	..	2	0.2	1.0	0.10		..	..
Eudorella emarginata Kr.	2	0.05	..	..	1.0	0.025		..	..
Eupagurus cuanensis Thompson	..	..	2	1.4	1.0	0.70	..	0.70	..
Pennatula phosphorea L.	..	..	4	3.8	2.0	1.90	..	..	2.00
Actiniidæ	1	0.2	..	..	0.5	0.10	..	..	
I alt / *Total*	265.7 g		167.4 g		216.55 g		21.55 g	110.45 g	84.55 g
1. Kl. Rødspætteføde / *1st Class Plaice Food*	12.5 -		30.6 -		21.55 -		..	..	..
2. Kl. Rødspætteføde / *2nd Class Plaice Food*	88.9 -		132.0 -		110.45 -		..	..	..
Ikke Rødspætteføde / *Not Plaice Food*	164.3 -		4.8 -		84.55 -		..	..	.

Tabel 4. Venus-Sam

Syd for Hals, Øst for Linien Fornæs—Vestende

Table 4. Venus-Com

South of Hals, East of the Line Fornæs—Western En

Farvand / *Valuation Series*	Isefjord-Gilleleje Flak		Sejerø-Havknude-Sletterhage		Hals-Østre Flak-Anholt		Gniben-Gilleleje Flak	
Aar / *Year*	1922		1922		1925		1922	
Dato / *Date*	$^{5}/_{5}$		$^{29-30}/_{5}$		$^{10}/_{6}$		$^{22}/_{8}$	
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	10		5		24		20	
A. = Antal pr. m²; V. = Raavægt i g pr. 1 m².. A. = *No. per sq. m.* V. = *Rough weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.
Syndosmya (Abra) alba (Wood) juv.	..	..	..	..	..	..	20.5	0.35
— — nitida (Müll.)	..	..	..	..	..	..	..	..
Macoma calcarea (Chemn.)	..	..	10	0.8	..	..	0.5	0.05
Tellina fabula Gron.	7	0.2	20	0.8	6.3	0.25	9.5	0.45
— tenuis D. C.	7	0.3	..	..	..	..	..	..
— pusilla Phil.	..	..	..	..	..	..	0.5	0.05
Saxicava rugosa (L.)	..	..	..	..	0.4	0.08	..	..
Mya sp. juv.	..	..	..	..	2.1	0.04	..	..
Corbula gibba Olivi	..	..	..	..	..	..	2.5	0.15
Thracia fragilis (Penn.)	..	..	..	..	..	..	0.5	0.05
Cultellus pellucidus (Penn.)	..	..	2	0.2	..	..	2.5	0.35
Ensis ensis (L.)	..	..	..	..	0.4	0.13	..	..
Spisula subtruncata (D. C.) juv.	..	..	8	0.2	2.1	0.04	233.5	3.75
— solida (L.)	..	..	4	13.2	0.8	0.38	0.5	0.75
— — juv.	..	..	..	..	..	..	..	..
Psammobia færöensis (Chemn.) juv.	..	..	..	..	..	..	0.5	0.05
Venus (Chione) gallina (L.)	..	..	..	..	12.9	5.58	1.0	0.05
Astarte montagui Dilw.	..	..	..	..	..	..	0.5	0.05
— borealis (Chemn.)	6	9.2	2	34.4	..	..	..	..
Cyprina islandica L.	1	15.7	..	..	..	..	0.5	12.00
— — juv.	..	..	10	0.4	..	..	..	..
Cardium fasciatum Mtg.	..	..	..	..	..	..	..	..
— norvegicum Spgl.	..	..	..	..	..	..	..	..
Axinus flexuosus (Mtg.)	..	..	..	..	..	..	0.5	0.05
Montacuta ferruginosa (Mtg.)	..	..	..	..	..	..	1.0	0.10
— bidentata (Mtg.)	1	0.1	..	..	0.8	0.04	4.0	
Nucula nitida Sowb.	..	..	..	..	..	..	1.0	0.25
— tenuis (Mtg.)	..	..	2	0.2	..	..	..	..
Modiolaria nigra Gray	..	..	..	..	..	..	..	..
— discors L.	..	..	..	..	3.3	2.38	..	..
Buccinum undatum L.	..	..	2	1.4	0.4	1.96	0.5	0.50
Nassa reticulata L.	..	..	..	..	..	..	1.0	0.15
Natica nitida Donov.	..	..	2	0.2	..	..	..	..
Amauropsis islandica Gmelin.	..	..	..	..	..	..	..	..
Bela turricula Mtg.	..	..	..	..	0.8	0.13	..	..
Aporrhais pes pelecani L. juv.	..	..	..	..	..	..	0.5	0.05
Turritella terebra L.	..	..	..	..	..	..	1.0	1.25

l ± Echinocardium.
æsø—Nordre Rønner Fyr—Skagens Fyrskib.
ity ± Echinocardium.
esø—Nordre Rønner Light—The Skaw Lightship.

Dybe Aalborgbugt				Anholt-Tangen				Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspættetøde *1st Class Plaice Food* per 1 m²	2. Kl. Rødspættetøde *2nd Class Plaice Food* per 1 m²	Ikke Rødspættetøde *Not Plaice Food* per 1 m²
1923		1922		1925		1926						
29/6		7/9		15/5		7/7						
20		20		20		20						
.	V.	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
.	..	..	..	..	..	..	..	2.6	0.04		..	..
.5	0.10	0.5	0.05	..	..	..	..	0.1	0.02		..	..
.	..	..	..	..	..	..	..	1.3	0.11		..	..
.5	0.20	6.0	0.15	..	..	8.0	0.20	8.0	0.28		..	..
.	..	..	..	..	..	..	..	0.9	0.04		..	..
.5	0.05	8.5	0.20	14.0	0.40	2.0	0.15	3.3	0.11		..	..
.	..	..	..	..	..	..	..	0.1	0.01	8.17	..	..
.	..	..	..	..	..	0.5	0.05	0.3	0.01		..	..
.	..	1.5	0.05	..	..	..	..	0.5	0.03		..	..
.	..	0.5	0.15	..	..	..	..	0.1	0.03		..	..
.0	0.40	1.0	0.10	..	..	2.0	0.25	1.1	0.16		..	..
.	..	..	..	..	..	..	..	0.1	0.02		..	..
.5	0.05	1054.5	53.50	5.5	0.85	1.5	0.10	163.2	7.31		..	..
.5	1.00	1.0	1.00	3.0	3.75	..	..	1.2	2.51	..	2.51	..
.	..	3.0	0.25	..	..	15.5	0.10	2.3	0.04	0.06	..	..
.	..	..	..	..	..	1.0	0.10	0.2	0.02		..	..
.5	8.15	7.0	3.60	0.5	0.25	3.5	3.60	3.7	2.65	..	2.66	..
.	..	..	..	..	..	..	..	0.1	0.01	..		..
. .	..	..	..	..	..	..	..	1.0	5.45	..	..	8.91
.	..	..	..	..	..	..	..	0.2	3.46	..	..	
. -	..	2.5	0.05	0.5	0.45	0.5	0.50	1.7	0.18		..	..
.5	0.10	..	..	1.0	0.15	..	..	0.2	0.03		..	..
.	..	..	..	..	..	1.0	1.05	0.1	0.13	0.39	..	..
.5	0.10	..	..	..	..	..	..	0.3	0.02		..	..
.0	0.05	..	..	..	..	..	..	0.3	0.03		..	..
.	..	..	..	..	..	..	..	0.7			..	..
.	..	..	..	..	..	..	..	0.1	0.03	..		..
.	..	..	..	..	..	..	..	0.3	0.03	..	0.55	..
.	..	..	..	..	..	0.5	1.50	0.1	0.19	..		..
.	..	..	..	..	..	..	..	0.4	0.30	..		..
.5	3.55	1.0	0.10	..	..	..	..	0.6	0.94	..	..	0.96
.	..	..	..	..	..	..	..	0.1	0.02	..	..	
.	..	0.5	0.05	..	..	..	..	0.3	0.03		..	..
.	..	..	..	0.5	0.10	..	..	0.1	0.01	0.06	..	..
.	..	..	..	..	..	..	..	0.1	0.02		..	..
.	..	..	..	..	..	..	..	0.1	0.01	..	0.01	..
.	..	1.5	0.05	..	..	..	..	0.3	0.16	..	..	0.16

Tabel 4 (fortsa

Farvand ... *Valuation Series*	Isefjord-Gilleleje Flak		Sejerø-Havknude-Sletterhage		Hals-Østre Flak-Anholt		Gniben-Gillelej Flak	
Aar ... *Year*	1922		1922		1925		1922	
Dato ... *Date*	5/5		29-30/5		10/6		23/8	
Antal Prøver à 0.1 m² ... *No. of Samples of 0.1 sq. m.*	10		5		24		20	
A. = Antal pr. m²; V. = Raavægt i g pr. 1 m² .. A. = *No. per sq. m.* V. = *Rough weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.
Scalaria communis Link.	..	..	2	0.6	..	..	..	..
Trochus cinerarius L.	..	..	2	0.4	..	..	..	..
Acmæa testudinalis Müll.	..	..	..	..	..	..	0.5	0.05
Philine aperta L.	..	..	..	..	1.3	0.13	3.5	0.10
Acera bullata Müll.	..	..	..	..	..	..	0.5	0.04
Chiton cinereus (L.)	..	..	6	0.4	..	..	0.5	0.05
Chætoderma nitidulum Lovén	..	..	..	..	..	..	..	..
Lepidonotus squamatus L.	..	..	2	0.2	..	..	..	..
Harmothoë sarsi Mgr.	..	..	..	..	..	..	..	..
Pholoë minuta Fabr.	..	..	..	..	0.4	0.04	..	..
Phyllodocidæ	..	..	..	..	..	..	..	..
Phyllodoce maculata L.	..	..	..	..	1.3	0.13	..	..
Nephthys hombergi Aud. & Edw.	8	1.0	12	3.6	2.1	0.54	8.5	1.80
— longosetosa Ørst.			6		4.2	0.75	1.0	
— ciliata O. F. M.			..		..	..	..	..
— incisa Mgr.			6		..	..	..	..
Nereis pelagica L.	..	..	..	..	2.5	0.25	..	..
Glycera sp.	..	..	..	..	0.4	0.08	0.5	0.05
Goniada maculata Ørst.	..	..	2	0.2	..	..	..	..
Scoloplos armiger (Müll.)	4	0.2	8	0.4	22.1	0.42	11.0	0.50
Cirratulidæ	..	..	..	..	..	..	1.0	0.05
Ophelia limacina Rthke	5	0.6	..	..	26.3	0.88	4.5	0.60
Ammotrypane aulogaster Rthke.	..	..	..	..	..	..	..	..
Travisia forbesi Rthke	46	3.2	..	..	2.1	0.17	1.5	0.10
Stylarioides glauca Mgr.	..	..	..	..	..	..	1.5	0.10
Scalibregma inflatum Rthke.	..	..	..	..	..	..	0.5	0.05
Pectinaria auricoma Müll.	..	..	..	..	..	..	1.5	0.50
— koreni Mgr.	1	0.2	..	..	0.4	0.04	23.0	1.75
— belgica Pall.	..	..	..	..	..	..	..	..
Terebellidæ	..	..	..	..	0.4	0.17	3.0	0.75
Artacama proboscidea Mgr.	..	..	..	..	..	..	0.5	0.15
Sabellidæ	..	..	..	..	..	..	..	..
Pomatoceros triqueter (Mørch.)	..	..	2	0.2	..	..	..	..
Nemertini	3	0.2	..	..	1.3	0.08	..	..
Planaria sp.	1	0.5	..	..	0.8	0.17	..	..
Amphiura filiformis (Müll.)	..	..	..	..	..	..	37.0	3.40
Ophiura albida Forb.	..	..	4	0.2	10.0	2.38	7.5	0.80
— robusta Ayr.	..	..	4	0.2	..	..	..	..
— affinis Ltk.	..	..	..	..	..	..	..	..
Asterias rubens L.	..	..	..	..	..	..	0.5	0.05

le 4 (continued).

Dybe Aalborgbugt				Anholt-Tangen				Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspættetøde *1st Class Plaice Food* per 1 m²	2. Kl. Rødspættetøde *2nd Class Plaice Food* per 1 m²	Ikke Rødspættetøde *Not Plaice Food* per 1 m²
1923		1922		1925		1926						
29/6		7/9		15/5		7/7						
20		20		20		20						
..	V.	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
.	..	..	..	..	..	..	..	0.3	0.08	..		..
.	..	..	..	..	..	..	..	0.3	0.05	..	0.14	..
.	..	..	..	..	..	..	..	0.1	0.01	..		..
.0	1.85	6.0	2.40	..	..	0.5	0.05	1.9	0.57	0.58	..	..
.	..	..	..	..	..	..	..	0.1	0.01		..	..
.	..	..	..	..	..	..	..	0.8	0.06	..	0.06	..
.	..	..	..	0.5	0.05	..	..	0.1	0.01	0.01	..	..
.	..	..	..	..	..	..	..	0.3	0.03		..	..
.	..	1.5	0.10	..	..	..	..	0.2	0.01		..	..
.	..	..	..	..	..	..	..	0.1	0.01		..	..
.	..	1.0	0.15	0.5	0.10	..	..	0.2	0.03		..	..
.	..	..	..	..	..	1.0	0.05	0.3	0.02		..	..
.0	0.45	2.5	0.55	..	..	0.5	0.05				..	..
.0	0.40	4.0	0.60	2.0	0.75	..	..				..	..
.5	0.35	..	..	..	..	..	..	8.0	1.36		..	..
.	..	..	..	..	..	..	..				..	..
.	..	..	..	..	..	0.5	0.15	0.4	0.05		..	..
:	..	3.5	0.15	..	..	1.0	0.05	0.7	0.04		..	..
.5	0.05	..	..	..	..	..	..	0.3	0.03		..	..
.0	0.15	18.0	0.40	26.5	0.60	11.0	0.60	13.1	0.41	6.92	..	..
.	..	..	..	..	..	..	..	0.1	0.01		..	..
.5	0.60	9.0	0.70	8.0	0.75	17.0	0.70	9.5	0.60		..	..
.5	0.40	1.0	0.05	..	..	0.5	0.15	0.5	0.08		..	..
.5	0.40	0.5	0.10	15.0	1.75	40.0	3.50	13.3	1.15		..	..
.	..	..	..	..	..	..	..	0.2	0.01		..	..
.5	0.15	1.5	0.10	..	..	..	..	0.4	0.04		..	..
.	..	..	..	..	..	..	..	0.2	0.06		..	..
.0	0.50	123.0	19.35	..	..	..	..	18.7	2.73		..	..
.5	0.50	..	..	..	..	..	..	0.1	0.06		..	..
.	..	1.0	0.10	..	..	..	..	0.6	0.13		..	..
.	..	..	..	..	..	..	..	0.1	0.02		..	..
.	..	..	..	..	..	0.5	0.35	0.1	0.04		..	..
.	..	..	..	..	..	..	..	0.3	0.03	..	..	0.03
.5	0.25	2.5	0.15	1.5	0.20	2.5	0.25	1.8	0.14	0.37	..	..
.0	0.55	3.0	0.65	..	..	..	..	0.7	0.23		..	..
.5	0.80	..	..	..	..	..	..	4.8	0.53	..		..
.5	2.75	19.5	2.85	6.0	1.15	7.5	0.50	8.5	1.33	..	1.97	..
.	..	..	..	..	..	..	..	0.5	0.03	..		..
.0	0.20	12.0	.30	..	..	1.5	0.10	2.1	0.08	..		..
.	..	..	..	..	..	..	..	0.1	0.01	..	..	0.01

Tabel 4 (fortsa

Farvand ... *Valuation Series*	Isefjord-Gilleleje Flak		Sejerø-Havknude-Sletterhage		Hals-Østre Flak-Anholt		Gniben-Gilleleje Flak	
Aar ... *Year*	1922		1922		1925		1922	
Dato ... *Date*	$^{5}/_{5}$		$^{29-30}/_{5}$		$^{10}/_{6}$		$^{23}/_{8}$	
Antal Prøver à 0.1 m ... *No. of samples of 0.1 sq. m.*	10		5		24		20	
A. = Antal pr. m²; V. = Raavægt i g pr. 1 m ... A. = *No. per sq. m.* V. = *Rough weight in g per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.
Echinocardium cordatum (Penn.)	..	..	4	46.4	2.1	19.88	2.0	18.50
— — juv.	..	..	10	1.4	..	..	3.5	3.25
Echinocyannus pusillus (Müll.)	..	..	28	0.6	4.2	0.33	1.0	0.10
Strongylocentrotus drøbakiensis (Müll.)	..	..	..	..	..	..	0.5	24.80
Hippomedon denticulatus (Sp. Bate)	..	..	..	..	0.4		..	..
Ampelisca brevicornis (Costa)	..	..	6	0.2	31.3		13.5	
— typica (Sp. Bate)	..	..	..	..	..		2.0	
Haustorius arenarius (Slabber)	1		..	..	..		..	
Bathyporeia pelagica (Sp. Bate)	1		..	..	2.9		2.0	0.40
— guilliamsoniana (Bate)	4	0.2	..	..	2.1		8.5	
— sp.	..		..	..	..	0.96	..	
Phoxocephalus holbølli	1		..	..	2.9		1.0	
Monoculodes carinatus (Sp. Bate)	..	..	..	..	..		..	..
Nototropis swammerdami (M.-Edw.)	..	..	..	..	..		..	..
— vedlomensis (Bate & Westw.)	..	..	..	..	..		..	..
Cheirocratus sundevalli (Rthke.)	..	..	..	..	0.4		..	..
Melita obtusata (Mont.)	..	..	..	..	0.4		..	..
Idothea baltica (Pallas)	6	0.4	..	..	0.4	0.04	..	..
Diastylis rathkei Kr.	..	..	..	..	2.1	0.04	1.0	00.5
— spinosa Norman	..	..	..	..	..	..	..	..
Lamprops fasciata G. O. Sars	..	..	..	..	..	..	..	..
Gastrosaccus spinifer Goës	4	0.2	..	..	0.8	0.04	2.0	0.05
Stenorhynchus rostratus L.	..	..	..	..	0.4	0.08	..	..
Eupagurus sp.	..	..	..	..	..	..	..	..
Crangon allmanni Kinahan	..	..	..	..	..	..	..	..
Actiniidæ	..	..	..	..	3.8	0.08	..	..
Cerianthus sp.	..	..	..	..	..	..	..	..
Edwardsia chrysanthellum (Leach.)	..	..	..	..	..	..	1.0	0.05
— sp.	..	..	..	..	..	..	..	..
Amphioxus lanceolatus Pall.	..	..	2	0.4	0.4	0.08	..	..
Ammodytes lancea Cuvier	..	..	..	..	..	..	..	..
I alt ... *Total*	32.2 g		107.2 g		38.77 g		78.55 g	
1. Klasses Rødspætteføde ... *1st Class Plaice Food*	7.3 -		7.6 -		5.88 -		12.50 -	
2. Klasses Rødspætteføde ... *2nd Class Plaice Food*	9.2 -		18.6 -		11.05 -		8.80 -	
Ikke Rødspætteføde ... *Not Plaice Food*	15.7 -		81.0 -		21.84 -		57.25 -	

ble 4 (continued).

Dybe Aalborgbugt				Anholt-Tangen				Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspættetøde *1st Class Plaice Food* per 1 m²	2. Kl. Rødspættetøde *2nd Class Plaice Food* per 1 m²	Ikke Rødspættetøde *Not Plaice Food* per 1 m²
1923		1922		1925		1926						
29/6		7/9		15/5		7/7						
20		20		20		20						
A.	V.	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
3.5	105.00	9.5	42.25	..	..	..	..	4.5	29.00	..	..	29.00
..	..	..	..	..	..	4.0	1.75	2.2	0.80	..	1.40	..
3.5	0.35	24.0	1.30	41.0	1.15	15.0	1.00	15.0	0.60	..		..
0.5	0.55	1.0	3.05	..	..	1.0	6.75	0.4	4.39	..	..	4.39
0.5		1.5		..	..	0.5		0.4			..	..
0.5		22.0		0.5		1.0		14.4			..	..
..		..		1.0		22.5		3.2			..	..
..		..		..		0.5		0.2			..	..
0.5		..		..	0.20	1.0	0.70	0.9			..	..
..	1.20	..	0.35	6.5		3.0		3.0			..	..
..		0.5		..		..		0.1			..	..
0.5		1.5		1.0		6.5		1.8	0.53		..	..
..		1.5		..	..	1.5		0.4			..	..
0.5		1.0		..	..	..	..	0.2		0.71	..	..
..	..	0.5		..	..	..	..	0.1			..	..
..	..	..	..	..	..	..	..	0.1			..	..
..	..	..	..	..	..	..	..	0.1			..	..
..	..	..	..	..	..	..	..	0.8	0.06		..	..
..	..	..	..	..	..	..	..	0.4	0.01		..	..
..	..	0.5	0.10	..	..	..	..	0.1	0.01		..	..
..	..	1.5		..	..	..	..	0.2			..	..
..	..	4.0	0.15	6.0	0.25	0.5	0.05	2.2	0.09		..	..
..	..	..	..	..	..	..	..	0.1	0.01		..	..
0.5	0.20	..	..	..	..	..	..	0.1	0.03	..	0.03	..
0.5	0.35	..	..	..	..	..	..	0.1	0.04	0.04	..	..
..	..	..	..	..	..	..	..	0.5	0.01	..	..	0.01
..	..	6.5	0.30	0.5	0.05	..	..	0.9	0.04		..	..
2.5	0.10	..	..	2.5	0.15	2.5	0.15	1.1	0.06	0.14	..	..
..	..	7.0	0.30	..	..	..	..	0.9	0.04		..	..
3.5	0.45	10.0	1.40	6.0	1.00	3.5	0.50	3.2	0.48	0.48	..	..
..	..	..	..	..	..	0.5	2.20	0.1	0.28	0.28	..	..
132.20 g		137.20 g		14.10 g		27.20 g		71.01 g		18.21	9.33	43.47
9.75 -		82.70 -		7.80 -		12.00 -		18.21 -				
13.45 -		9.05 -		6.30 -		8.45 -		9.33 -				
109.10 -		45.45 -		..		6.75 -		43.47 -				

Tabel 5. Echinocardium-Venus-Samfundet.

Nord for Hals, Øst for Linien Fornæs—Vestenden af Læsø—Nordre Rønner Fyr—Skagens Fyrskib.

Table 5. Echinocardium-Venus-Community.

North of Hals, East of the Line Fornæs—Western End of Læsø—Nordre Rønner Light—The Skaw Lightship.

Farvand / *Valuation Series*	Frederikshavn—N. om Læsø		Læsø—Lille Middelgrund—Anholt		Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food*	2. Kl. Rødspætteføde *2nd Class Plaice Food*	Ikke Rødspætteføde *Not Plaice Food*
Aar / *Year*	1926		1926						
Dato / *Date*	5/7		6/7						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	12		14				per 1 m²	per 1 m²	per 1 m²
A. = Antal pr. m²; V. = Raavægt i g pr. 1 m² / A. = *Number per sq. m.* V. = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	V.	V.	V.
Syndosmya (Abra) alba (Wood)	1.7	0.08	..	..	0.9	0.04		..	..
— — prismatica (Mtg.)	0.8	0.08	0.7	0.14	0.8	0.11		..	..
Tellina fabula Gron	9.2	0.67	20.0	1.50	14.6	1.04		..	..
— pusilla Phil.	..	..	1.4	0.07	0.7	0.03	3.37	..	..
Cultellus pellucidus (Penn.)	3.3	0.58	3.6	0.71	3.5	0.65		..	..
Ensis ensis (L.)	2.5	2.83	..	..	1.3	1.42		..	..
Spisula subtruncata (D. C.) juv.	0.8	0.08	4.3	0.07	2.6	0.08		..	..
— solida (L.)	4.2	0.92	0.7	0.71	2.5	0.82	..		..
Venus (Chione) gallina (L.)	0.8	0.67	0.7	0.07	0.8	0.37	..	1.61	..
Dosinia lincta (Putn.)	0.8	0.83	..	..	0.4	0.42	..		..
Cardium nodosum Turt.	..	..	0.7	0.07	0.4	0.04		..	..
Axinus flexuosus (Mtg.)	..	..	1.4	0.07	0.7	0.04	0.12	..	..
Montacuta ferruginosa (Mtg.)	1.7	0.08	..	..	0.9	0.04		..	..
Nucula nitida Sowb.	1.7	0.75	1.4	0.36	1.6	0.56	..	0.56	..
Nassa pygmæa Lam.	..	..	0.7	0.14	0.4	0.07	..	..	0.07
Natica nitida Donov.	0.8	0.08	2.9	0.14	1.9	0.11	0.11	..	..
Aporrhais pes pelecani L.	..	..	0.7	3.07	0.4	1.54	..	..	2.74
Turritella terebra L.	1.7	0.25	2.9	2.14	2.3	1.20	..	..	
Acmæa testudenalis Müll.	..	..	0.7	0.07	0.4	0.04	..	0.04	..
Cylichna cylindracea Penn.	..	..	1.4	0.07	0.7	0.04		..	..
Philine aperta L.	..	..	0.7	0.14	0.4	0.07	0.11	..	..
Dentalium entalis L.	..	..	3.6	1.21	1.8	0.61	..	..	0.61
Chætoderma nitidulum Lovén	0.8	0.08	..	..	0.4	0.04	0.04	..	..
Aphrodite aculeata L.	..	..	1.4	0.43	0.7	0.22		..	..
Sigalion mathildæ Aud. & Edw.	0.8	0.08	..	..	0.4	0.04		..	..
Nephthys hombergi Aud. & Edw.	4.2	0.75	13.6	2.43	8.9	1.59		..	..
— coeca Fabr.	0.8	0.75	..	..	0.4	0.38		..	..
— longosetosa Ørst.	1.7	0.17	0.7	0.07	1.2	0.12		..	..
— rubella Mich.	..	..	1.4	0.14	0.7	0.07	3.01	..	..
Glycera goësi Mgr.	0.8	0.08	..	..	0.4	0.04		..	..
Goniada maculata Ørst.	0.8	0.08	0.7	0.07	0.8	0.08		..	..
Scoloplos armiger (O. F. M.)	6.7	0.17	..	..	3.9	0.09		..	..
Ophelia limacina Rthke.	4.2	0.33	1.4	0.07	2.8	0.20		..	..
Travisia forbesi Rthke.	..	..	0.7	0.36	0.4	0.18		..	..

Tabel 5 (fortsat). Table 5 (continued).

Farvand / *Valuation Series*	Frederikshavn—N. om Læsø		Læsø—Lille Middelgrund—Anholt		Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food*	2. Kl. Rødspætteføde *2nd Class Plaice Food*	Ikke Rødspætteføde *Not Plaice Food*
Aar / *Year*	1926		1926						
Dato / *Date*	5/7		6/7						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	12		14				per 1 m²	per 1 m²	per 1 m²
A. = Antal pr. m²; V. = Raavægt i g pr. 1 m² / A. = *Number of sq. m.* V. = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	V.	V.	V.
Notomastus latericius Sars	..	..	2.1	0.36	1.1	0.18	0.81	..	..
Maldanidæ	..	..	2.9	0.43	1.5	0.22		..	..
Pectinaria auricoma O. F. M.	..	..	0.7	0.07	0.4	0.04		..	..
Terebellidæ	..	..	1.4	0.36	0.7	0.18		..	..
Ampharetidæ	..	..	0.7	0.07	0.4	0.04		..	..
Nemertini	..	..	2.9	0.29	1.5	0.15		..	..
Ophiopholis aculeata (O. F. M.)	0.8	0.08	0.7	0.36	0.8	0.22	..	..	0.22
Amphiura chiajei Forb.	3.3	0.83	..	..	1.7	0.42	..	2.64	..
— filiformis (O. F. M.)	5.0	0.67	2.1	0.50	3.6	0.59	..		..
Ophiura albida Forb.	10.0	2.67	3.6	0.50	6.8	1.59	..		..
— robusta Ayr.	..	..	0.7	0.07	0.4	0.04	..		..
Echinocardium cordatum (Penn.)	10.0	95.58	7.9	49.07	9.0	72.33	..	..	72.33
Echinocyamus pusillus (O. F. M.)	10.8	1.00	7.9	0.43	9.4	0.72	..	0.72	..
Psammechinus miliaris (Gmel.)	0.8	1.00	..	..	0.4	0.50	..	..	0.50
Ampelisca brevicornis (Costa)	0.8	0.33	0.7	0.36	0.8	0.35	0.39	..	..
— typica (Sp. Bate)	3.3		8.6		6.0			..	..
Bathyporeia pelagica (Sp. Bate)	3.3		1.4		2.4			..	..
— guilliamsoniana (Bate)	2.5		0.7		1.6			..	..
Monoculodes carinatus (Sp. Bate)	0.8		..		0.4			..	..
Gammarus locusta L.	..	..	0.7		0.4			..	..
Melita obtusata (Mont.)	..	..	0.7		0.4			..	..
Gastrosaccus spinifer Goës	1.7	0.08	..	..	0.9	0.04		..	..
Eupagurus bernhardus L.	0.8	2.25	0.7	0.57	0.4	1.41	..	1.45	..
— cuanensis Thompson	..	..	0.7	0.07	0.4	0.04	..		..
Eurynome aspera Leach	..	..	1.4	0.07	0.7	0.04	0.04	..	..
Foraminifera	..	..	2.1	0.14	1.1	0.07	..	..	0.07
Cerianthus sp.	..	..	1.4	0.07	0.7	0.04	0.04	..	..
Ascidiæ	..	..	5.7	16.43	2.9	8.22	..	..	8.22
Amphioxus lanceolatus Pall.	5.0	1.17	0.7	0.43	2.9	0.80	0.80	..	..
I alt / *Total*	116.05 g		84.97 g		100.62 g		8.84	7.02	84.76
1. Kl. Rødspætteføde / *1st Class Plaice Food*	8.55 -		9.06 -		8.84 -		..	..	..
2. Kl. Rødspætteføde / *2nd Class Plaice Food*	10.59 -		3.35 -		7.02 -		..	..	..
Ikke Rødspætteføde / *Not Plaice Food*	96.91 -		72.56 -		84.76 -		..	..	..

Tabel 6. Amphiura-filiformis-Samfund med Echinocardium.

Syd for Hals, Øst for Linien Fornæs—Vestenden af Læsø—Nordre Rønner Fyr—Skagens Fyrskib.

Table 6. Amphiura filiformis-Community with Echinocardium.

South of Hals, East of the Line Fornæs—Western End of Læsø—Nordre Rønner Light—The Skaw Lightship.

Farvand / *Valuation Series*	Sejerø—Havknude—Sletterhage		5—10 Sm. N.O. f. Schultz's Grund		Snekkeløbet—Hesselø—Isefjorden		Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspættefode *1st Class Plaice Food*	2. Kl. Rødspættefode *2nd Class Plaice Food*	Ikke Rødspættefode *Not Plaice Food*
Aar / *Year*	1922		1922		1922						
Dato / *Date*	29-30/5		23/7		3/5						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	12		10		15				per 1 m²	per 1 m²	per 1 m²
A. = Antal pr. m²; V. = Raavægt i g pr. m² / A. = *Number per sq. m.* V. = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
Syndosmya (Abra) alba (Wood) juv.	20.0	0.25	6	0.2	..	..	8.7	0.15	0.23	..	..
— — nitida (Müll.)	3.3	0.17	..	..	0.7	0.07	1.3	0.08		..	..
— — prismatica (Mtg.)	..	..	1	0.3	..	..	0.3	0.10		..	..
Macoma calcarea (Chem.)	0.8	2.17	..	..	2.0	4.67	0.9	2.28	..	2.28	..
Tellina fabula Gron.	..	..	4	0.2	..	..	1.3	0.07	1.61	..	..
Mya truncata L. juv.	..	..	1	0.2	..	..	0.3	0.07		..	..
Cultellus pellucidus (Penn.)	1.7	0.25	14	3.0	4.7	0.20	6.8	1.15		..	..
Spisula subtruncata (D. C.) juv.	3.3	0.08	51	0.8	..	..	18.1	0.29		..	..
Psammobia færøensis (Chemn.) juv.	..	..	2	0.1	..	..	0.7	0.03		..	..
Venus (Chione) gallina (L.)	..	..	1	0.4	..	..	0.7	0.13	..	0.27	..
— — ovata (Penn.)	0.8	0.42	..	..	..	..	0.3	0.14	..		..
Cyprina islandica L.	..	..	..	..	5.3	186.67	1.8	62.22	..	..	62.22
— — juv.	1.7	0.17	..	..	0.7	0.07	0.8	0.08	0.20	..	..
Montacuta ferruginosa (Mtg.)	3.3	0.10	1	0.1	2.0	0.20	2.2	0.10		..	..
— bidentata (Mtg.)	2.5	0.07	..	..	..	..	0.8	0.02		..	..
Leda pernula (Müll.)	..	..	..	..	0.7	1.60	0.2	0.53	..	1.85	..
— minuta (Müll.)	..	..	1	0.2	1.3	0.20	0.8	0.13	..		..
Nucula nitida Sowb.	..	..	5	2.5	..	..	1.7	0.83	..		..
— tenuis (Mtg.)	4.2	0.25	5	0.5	4.0	0.33	4.4	0.36	..		..
Crenella decussata (Mtg.)	..	..	..	..	1.3	0.07	0.4	0.02	0.02	..	..
Buccinum undatum L. juv.	..	..	1	0.3	..	..	0.3	0.10	..	0.10	..
Bela turricula Mtg.	..	..	..	..	0.7	0.07	0.2	0.02	0.02	..	..
Aporrhais pes pelecani L.	1.7	3.25	1	5.2	0.7	3.00	1.1	3.82	..	..	6.01
Turritella terebra L.	8.3	5.00	1	0.7	6.7	1.13	5.3	2.28	..	..	
Cylichna cylindracea Penn.	..	..	..	..	0.7	0.07	0.2	0.02	0.18	..	..
Philine aperta L.	0.8	0.08	4	0.4	..	..	1.6	0.16		..	..
Chiton cinereus (L.)	..	..	..	..	1.3	0.20	0.4	0.07	..	0.07	..
Harmothoë sarsi Mgr.	..	..	4	0.2	..	..	1.3	0.07	3.29	..	..
Pholoë minuta Fabr.	..	..	2	0.1	..	..	0.7	0.03		..	..
Phyllodocidæ	0.8	0.17	..	..	..	..	0.3	0.06		..	..
Glycera sp.	0.8	0.25	1	0.1	0.7	0.07	0.8	0.14		..	..
Goniada maculata Ørst.	0.8	0.17	..	..	1.3	0.13	0.7	0.10		..	..
Scoloplos armiger (Müll.)	1.7	0.08	..	..	1.3	0.13	1.0	0.07		..	..
Aricia sp.	..	..	..	..	0.7	0.13	0.2	0.04		..	..
Nephthys hombergi Aud. & Edw.	5.8	3.92	4	2.8	17.3	1.20	9.0	2.64		..	..
— longosetosa Ørst.	..		4		..		1.3			..	..
— coeca Fabr.	..		5		0.7		1.9			..	..
— incisa Mgr.	5.9		1		1.3		2.7			..	..
Travisia forbesi Rthke.	..	..	1	0.1	..	..	0.3	0.03		..	..
Stylarioides glauca Mgr.	6.7	0.33	..	..	..	..	2.2	0.11		..	..

Tabel 6 (fortsat). Table 6 (continued).

Farvand / *Valuation Series*	Sejerø—Havknude—Sletterhage		5—10 Sm. N.O. f. Schultz's Grund		Snekkeløbet—Hesselø—Isefjorden		Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food*	2. Kl. Rødspætteføde *2nd Class Plaice Food*	Ikke Rødspætteføde *Not Plaice Food*
Aar / *Year*	1922		1922		1922						
Dato / *Date*	29-30/5		23/7		3/5						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	12		10		15				per 1 m²	per 1 m²	per 1 m²
A. = Antal pr. m²; V. = Raavægt i g pr. m² / A. = *Number per sq. m.* V. = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
Notomastus latericius Sars	..	..	..	..	2.0	0.33	0.7	0.11		..	..
Maldanidæ	28.3	1.58	..	..	4.7	0.33	12.3	0.64		..	..
Pectinaria auricoma Müll.	..	..	2	0.6	3.3	0.67	1.8	0.42	2.85	..	..
— belgica Pall.	0.8	3.25	..	..	..	..	0.3	1.08		..	..
Terebellidæ	6.7	1.67	..	..	2.0	0.13	2.9	0.60		..	..
Phascolion strombi Mont.	0.8	0.17	..	..	1.3	0.20	0.4	0.12	..	0.12	..
Nemertini	0.8	0.33	..	..	0.7	0.27	0.5	0.20	0.27	..	..
Planaria sp.	..	..	1	0.2	..	..	0.3	0.07		..	..
Ophiopholis aculeata (Müll.)	0.8	1.00	..	..	..	..	0.3	0.33	..	..	0.33
Amphiura chiajei Forb.	1.7	0.33	..	..	..	..	0.6	0.11	..		..
— filiformis (Müll.)	200.8	33.67	21	5.0	150.0	21.00	123.9	19.89	..		..
Ophiura albida Forb.	22.5	1.00	10	2.1	17.3	4.67	16.6	2.59	..	23.11	..
— texturata Lam.	4.2	0.25	..	..	0.7	0.80	1.6	0.35	..		..
— robusta Ayr.	..	..	5	0.4	..	..	1.7	0.13	..		..
— affinis Ltk.	..	..	..	..	2.0	0.13	0.7	0.04	..		..
Spatangus purpureus Müll.	..	..	1	48.5	..	..	0.3	16.17	..	..	104.20
Echinocardium cordatum (Penn.)	15.8	106.00	9	98.5	10.7	59.60	11.8	88.03	..	..	
Echinocyamus pusillus (Müll.)	5.8	0.33	2	0.2	2.0	0.07	3.3	0.20	..	0.20	..
Strongylocentrotus drøbachiensis (Müll.)	0.8	3.67	1	9.0	0.7	5.40	0.8	6.02	..	..	7.98
Cucumaria elongata Düb. & Kor.	0.8	1.08	..	..	..	..	0.3	0.36	..	..	
Psolus phantapus (Struss.)	..	..	..	..	0.7	4.80	0.2	1.60	..	..	
Tmetonyx cicada (O. Fabr.)	..	..	..	..	0.7		0.2			..	..
Ampelisca brevicornis (Costa)	12.5		44	1.5	44.7	1.33	33.7			..	..
— macrocephala Lillj.	3.3		..	..	1.3		1.5	1.17		..	..
— sp.	1.7	0.67	..	..	..	..	0.6			..	..
Monoculodes carinatus (Sp. Bate)	1.7		..	..	..	..	0.6		1.25	..	..
Melita obtusata (Mont.)	0.8		..	..	..	..	0.3			..	..
Diastylis sp.	..	..	..	..	0.7	0.07	0.2	0.02		..	..
Leucon nasicus Kr.	0.8	0.17	..	..	..	..	0.3	0.06		..	..
Eudorella emarginata Kr.	8.3		..	..	..	..	2.8			..	..
Eupagurus bernhardus K.	0.8	0.33	..	..	..	..	0.3	0.11	..	0.11	..
Virgularia mirabilis (Müll.)	1.7	0.58	..	..	0.7	0.20	0.8	0.26	..	..	0.26
Edwardsia sp.	..	..	6	0.1	..	..	2.0	0.03	0.03	..	..
Actiniidæ	0.8	0.75	..	..	..	..	0.3	0.25	..	..	0.25
I alt / *Total per sq. m.*	174.01 g		184.5 g		300.21 g		219.50 g		10.05 g	28.11 g	181.34 g
1. Kl. Rødspætteføde / *1st Class Plaice Food*	13.76 -		11.0 -		5.54 -		10.05 -		..	..	..
2. Kl. Rødspætteføde / *2nd Class Plaice Food*	38.92 -		11.6 -		33.87 -		28.11 -		..	..	..
Ikke Rødspætteføde / *Not Plaice Food*	121.33 -		161.9 -		260.80 -		181.34 -		..	..	..

Tabel 7. Brissopsis-Amphiura chiajei-Samfund.

Syd for Hals, Vest for Linien Fornæs—Vestenden af Læsø—Nordre Rønner Fyr—Skagens Fyrskib.

Table 7. Brissopsis-Amphiura chiajei-Community.

South of Hals, West of the Line Fornæs—Western End of Læsø—Nordre Rønner Light—The Skaw Lightship.

Farvand / *Valuation Series*	Læsø—Lille Middelgrund—Anholt		Anholt—østefter				Store Middelgrund—Anholt		Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food*	2. Kl. Rødspætteføde *2nd Class Plaice Food*	Ikke Rødspætteføde *Not Plaice Food*
Aar / *Year*	1926		1922		1925		1922						
Dato / *Date*	6/7		24/7		14/5		23/7						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	10		10		20		10				per 1 m²	per 1 m²	per 1 m²
A. = Antal pr. m²; V. = Raavægt i g pr. m² / A. = *No. per sq. m.* V. = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
Syndosmya (Abra) nitida (Müll.)	3	0.2	12	3.3	3.5	0.55	10	1.6	7.1	1.41	1.57	..	..
Cultellus pellucidus (Penn.)	..	..	..	..	0.5	0.35	1	0.3	0.4	0.16		..	..
Cyprina islandica L.	..	..	..	..	1.0	1.35	..	..	0.3	33.75	..	..	33.75
Cardium minimum Phil.	..	..	..	..	..	..	4	0.2	1.0	0.05	0.26	..	..
Axinus flexuosus (Mtg.)	7	0.4	3	0.2	1.0	0.05	4	0.2	3.8	0.21		..	..
Leda minuta (Müll.)	..	..	2	0.4	..	..	1	0.1	0.8	0.13	..	5.35	..
Nucula tenuis (Mtg.)	2	0.1	1	0.1	2.0	0.25	5	0.4	2.5	0.21	..		..
— sulcata (Bronn.)	11	8.3	1	1.7	3.0	2.15	2	1.3	4.3	3.36	..		..
Modiolaria nigra Gray	..	..	1	6.6	..	..	..	..	0.3	1.65	..		..
Natica catena Da Costa	..	..	..	..	0.5	0.30	..	..	0.1	0.08	0.08	..	..
— pallida Brod. & Son.	..	..	..	..	0.5		..	..	0.1			..	..
Turritella terebra L.	..	..	9	2.4	31.5	6.30	14	6.4	13.6	3.78	..	..	3.78
Cylichna cylindracea Penn.	1	0.1	..	..	..	..	..	..	0.3	0.03	0.12	..	..
Philine scabra Müll.	..	..	1	0.1	1.5	0.25	..	..	0.6	0.09		..	..
Dentalium entalis L.	2	1.3	10	5.6	6.0	3.05	..	..	4.5	2.49	..	..	2.49
Chætoderma nitidulum Lovén	1	0.1	..	..	..	..	..	..	0.3	0.03	0.03	..	..
Aphrodite aculeata L.	..	..	1	4.2	3.5	5.00	..	..	1.1	2.30	..	2.30	..
Enipo kinbergi Mgr.	..	..	..	..	0.5	0.20	..	..	0.1	0.05	17.11	..	..
Panthalis ørstedi Kinb.	..	..	..	..	0.5	1.55	..	..	0.1	0.39		..	..
Phyllodocidæ	..	..	1	0.1	1.0	0.05	..	..	0.5	0.04		..	..
Ophiodromus flexuosus Della Chiaje	..	..	2	0.1	1.0	0.10	1	0.1	1.0	0.08		..	..
Lumbrinereis fragilis Ehl.	2	0.2	1	0.1	1.5	6.75	..	..	1.1	1.76		..	..
Glycera sp.	4	1.1	4	0.2	4.0	2.25	3	0.5	3.8	1.01		..	..
Goniada maculata Ørst.	4	0.6	1	0.1	2.0	0.30	3	0.4	2.5	0.35		..	..
Aricia sp.	..	..	..	..	0.5	0.10	..	..	0.1	0.03		..	..
Nephthys hombergi Aud. & Edw.	8	0.6	6		3.0							..	..
— ciliata O. F. M.	..	..	1		..	1.75						..	..
— incisa Mgr.	2	0.2	..	2.0	6.0		5	0.8	8.5	1.91		..	..
— paradoxa Malm.	2	2.3	1		..	..						..	..
Ammotrypane aulogaster Rthke	..	..	1	0.1	0.5	0.05	2	0.6	0.9	0.19		..	..
Stylarioides glauca Mgrn.	..	..	3	0.2	0.5	0.05	5	0.4	2.1	0.16		..	..
Eumenia crassa Ørst.	3	2.0	9	14.0	5.5	4.10	1	1.5	4.6	5.40		..	..
Notomastus latericius Sars	..	..	..	..	2.5	0.10	6	1.6	2.1	0.43		..	..
Maldanidæ	5	0.4	14	0.9	15.0	1.15	27	2.0	15.3	1.11		..	..
Pectinaria auricoma O. F. M.	1	0.2	18	3.7	3.0	0.70	10	1.3	8.0	1.48		..	..
— belgica Pall.	1	1.0	..	..	1.0	0.80	2	5.7	1.0	1.88		..	..
Ampharetidæ	2	0.3	2	0.2	2.0	0.15	1	0.1	1.8	0.19		..	..
Terebellides strømi Sars	..	..	..	..	0.5	0.40	..	..	0.1	0.10		..	..
— sp.	..	..	3	0.3	1.5	0.90	3	1.0	1.9	0.55		..	..
Phascolion strombi Mont.	..	..	4	0.5	1.5	0.20	2	0.3	1.9	0.25	..	0.25	..
Balanoglossus kupfferi W. Suhm	..	..	1	0.1	1.0	0.15	..	..	0.5	0.06	0.06	..	..

Tabel 7 (fortsat). Table 7 (continued).

Farvand / *Valuation Series*	Læsø—Lille Middelgrund—Anholt		Anholt—østefter				Store Middelgrund—Anholt		Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food*	2. Kl. Rødspætteføde *2nd Class Plaice Food*	Ikke Rødspætteføde *Not Plaice Food*
Aar / *Year*	1926		1922		1925		1922						
Dato / *Date*	6/7		24/7		14/5		23/7						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	10		10		20		10				per 1 m²	per 1 m²	per 1 m²
A. = Antal pr. m²; V. = Raavægt i g pr. m² / A. = *No. per sq. m.* V. = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	A.	V.	A.	V.	V.	V.	V.
Nemertini	..	..	3	0.5	1.0	0.10	2	0.2	1.5	0.20	0.23	..	..
Planaria sp.	1	0.1	..	..	..	..	..	..	0.3	0.03		..	..
Amphiura chiajei Forb.	82	17.3	58	16.5	21.5	5.30	36	10.5	49.4	12.40	..	19.77	..
— filiformis (O. F. M.)	44	5.5	95	9.5	43.5	5.35	41	6.0	55.9	6.59	..		..
Ophiura albida Forb.	1	0.2	1	0.2	1.5	0.65	2	0.1	1.4	0.29	..		..
— texturata Lam.	1	1.4	..	..	..	..	..	..	0.3	0.35	..		..
— robusta Ayr.	..	..	1	0.1	..	..	..	..	0.3	0.03	..		..
— affinis Ltk.	1	0.1	2	0.1	0.5	0.05	3	0.2	1.6	0.11	..		..
Luidia sarsi Düb. & Kor.	..	..	..	..	0.5	17.25	..	..	0.1	4.31	..	..	47.86
Brissopsis lyrifera Forb.	1	38.1	1	25.2	3.5	48.00	1	2.6	1.6	28.48	..	..	
Echinocardium cordatum (Penn.)	6	55.7	..	..	..	..	..	..	1.5	13.93	..	..	
Psammechinus miliaris (Gmel.)	..	..	..	..	..	..	1	2.0	0.3	0.50	..	..	
Cucumaria elongata Düb. & Kor.	1	2.3	..	..	0.5	0.25	..	..	0.4	0.64	..	..	
Ampelisca brevicornis (Costa)	..	..	1	1.0	1.0	0.50	2	0.8	1.0	0.63	2.49	..	..
— macrocephala Lillj.	1	0.2	1		1.5		1		1.1			..	..
— sp.	6		8		4.0		33		12.8			..	..
Haploops tubicola Lillj.	..	..	21		13.5		11		11.4			..	..
Byblis gaimardi Kr.	..	..	..		1.0		..		0.3			..	..
Monoculodes carinatus (Sp. Bate)	..	..	..		..	..	1		0.3			..	..
Melita obtusata (Mont.)	..	..	2		..	..	..	..	0.5			..	..
Neohela monstrosa (Boeck)	..	..	..	..	..	..	1	0.1	0.3	0.03		..	..
Moera loveni Bruzelius	2	0.1	2	0.3	0.5	0.10	2	0.2	1.6	0.18		..	..
Diastylis lucifera Kr.	1	0.1	2	0.2	..	..	..	..	0.8	0.23		..	..
Leucon nasicus Kr.	8	0.2	5		..	..	2	0.3	3.8			..	..
Eudorella emarginata Kr.	1	0.1	4		..	..	11		4.0			..	..
Gebia stellata Leach.	1	0.1	..	..	..	..	..	..	0.3	0.03		..	..
Portunus pusillus Leach.	..	..	1	1.5	1.0	0.55	..	..	0.5	0.51		..	..
Calocaris mac'andreæ Bell.	1	1.1	..	..	0.5	0.50	..	..	0.4	0.40		..	..
Nika edulis Risso	..	..	..	..	..	..	1	0.3	0.3	0.08		..	..
Nephrops norvegicus L. juv.	..	..	1	1.0	..	..	..	..	0.3	0.25		..	..
Ostracoda	6	0.1	43	0.3	..	..	37	0.2	21.5	0.15		..	..
Virgularia mirabilis (O. F. M.)	2	0.1	..	..	..	..	..	..	0.5	0.03	..	..	0.03
Actiniidæ	..	..	..	..	..	..	2	0.5	0.5	0.13	..	..	0.13
Ascidiæ	1	2.1	3	1.6	..	..	1	0.1	1.3	0.95	..	..	0.95
Foraminifera	1	0.1	..	..	..	..	..	..	0.3	0.03	..	..	0.03
I alt / *Total*	144.4 g		105.2 g		253.65 g		50.9 g		138.64 g		21.95 g	27.67 g	89.02 g
1. Kl. Rødspætteføde / *1st Class Plaice Food*	11.8 -		30.5 -		24.85 -		20.4 -		21.95 -		..	..	..
2. Kl. Rødspætteføde / *2nd Class Plaice Food*	32.9 -		39.9 -		18.95 -		18.9 -		27.67 -		..	..	..
Ikke Rødspætteføde / *Not Plaice Food*	99.7 -		34.8 -		209.85 -		11.6 -		89.02 -		..	..	..

Tabel 8. Haploops-Samfund.

Syd for Hals, Øst for Linien Fornæs—Vestenden af Læsø—Nordre Rønner Fyr—Skagens Fyrskib.

Table 8. Haploops-Community.

South of Hals, East of the Line Fornæs—Western End of Læsø—Nordre Rønner Light—The Skaw Lightship.

Farvand / *Valuation Series*	Anholt—Kullen				Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspættefode *1st Class Plaice Food* per 1 m²	2. Kl. Rødspættefode *2nd Class Plaice Food* per 1 m²	Ikke Rødspættefode *Not Plaice Food* per 1 m²
Aar / *Year*	1922		1925						
Dato / *Date*	$^{25}/_{7}$		$^{11}/_{6}$						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	14		14						
A. = Antal pr. 1 m²; V. = Raavægt i g pr. 1 m² / A. = *Number per sq. m.* V. = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	V.	V.	V.
Syndosmya (Abra) nitida (Müll.) (*juv.)	*0.7	0.07	0.7	0.14	0.7	0.11	0.11	..	..
Astarte montagui Dillw.	0.7	0.29	0.7	0.07	0.7	0.18	..	0.18	..
Cardium minimum Phil.	0.7	0.07	..	..	0.4	0.04	0.26	..	..
— fasciatum Mtg.	2.9	0.29	..	..	1.5	0.15		..	..
Axinus flexuosus Mtg.	2.1	0.14	..	..	1.1	0.07		..	..
Leda pernula (Müll.)	2.1	1.14	..	..	1.1	0.57	..	1.07	..
— minuta (Müll.)	0.7	0.14	2.1	0.14	1.4	0.14	..		..
Nucula tenuis (Mtg.)	4.3	0.36	7.1	0.36	5.7	0.36	..		..
Lima loscombii Sow.	0.7	0.14	1.4	1.21	1.1	0.68	0.68	..	..
Pecten septemradiatus (Müll.)	1.4	4.43	..	..	0.7	2.22	..	..	2.22
Natica catena Da Costa	0.7	0.21	..	..	0.4	0.11	0.11	..	..
Turritella terebra L.	1.4	0.79	2.1	0.36	1.8	0.58	..	..	0.58
Aphrodite aculeata L.	3.6	13.86	0.7	4.64	2.2	9.25	..	9.25	..
Polynoidæ	2.1	0.21	0.7	0.07	1.4	0.14	9.89	..	..
Nereis sp.	..	..	0.7	0.07	0.4	0.04		..	..
Glycera sp.	1.4	0.36	3.6	0.71	2.5	0.54		..	..
Goniada maculata Ørst.	0.7	1.21	2.9	0.36	1.8	0.79		..	..
Nephthys hombergi Aud. & Edw.	1.4	0.14	1.4	0.29	1.4	0.22		..	..
— ciliata O. F. M.	1.4	1.43	..	..	0.7	0.72		..	..
— incisa Mgr. (*?)	*1.4	0.57	1.4	1.29	1.4	0.93		..	..
Ammotrypane aulogaster Rthke.	0.7	0.14	..	..	0.4	0.07		..	..
Stylarioides glauca Mgrn.	0.7	0.07	0.7	0.07	0.7	0.07		..	..
Eumenia crassa Ørst.	1.4	2.79	0.7	0.57	1.1	1.68		..	..
Scalibregma inflatum Rthke.	..	..	2.9	0.14	1.5	0.07		..	..
Notomastus latericius Sars	3.6	0.43	8.6	0.36	6.1	0.40		..	..
Maldanidæ	92.9	4.43	30.0	0.71	61.5	2.57		..	..
Pectinaria auricoma O. F. M.	2.9	0.93	2.1	0.43	2.5	0.68		..	..
— belgica Pall.	..	..	0.7	1.79	0.4	0.90		..	..
Ampharetidæ	0.7	0.14	..	..	0.4	0.07		..	..

Tabel 8 (fortsat). Table 8 (continued).

Farvand / *Valuation Series*	Anholt—Kullen				Total Gennemsnit *Total Average* per 1 m²		1. Kl. Rødspætteføde *1st Class Plaice Food* per 1 m²	2. Kl. Rødspætteføde *2nd Class Plaice Food* per 1 m²	Ikke Rødspætteføde *Not Plaice Food* per 1 m²
Aar / *Year*	1922		1925						
Dato / *Date*	25/7		11/6						
Antal Prøver à 0.1 m² / *No. of Samples of 0.1 sq. m.*	14		14						
A. = Antal pr. m²; V. = Raavægt i g pr. 1 m² / A. = *Number per sq. m.* V. = *Rough Weight in g. per sq. m.*	A.	V.	A.	V.	A.	V.	V.	V.	V.
Terebellides strømi Sars	..	..	0.7	0.14	0.4	0.07	2.45	..	..
Terebellidæ	1.4	0.79	..	..	0.7	0.40		..	..
Sabellidæ	0.7	1.00	..	..	0.4	0.50		..	..
Phascolosoma margaritaceum Sars	..	..	0.7	0.07	0.4	0.04		..	..
Balanoglossus kupfferi W. Suhm	1.4	0.21	..	..	0.7	0.11		..	..
Nemertini	5.7	0.86	11.4	1.79	8.6	1.33		..	..
Amphiura chiajei Forb.	..	..	0.7	0.21	0.4	0.11	..	4.47	..
— filiformis (O. F. M.)	5.7	1.07	10.7	1.57	8.2	1.32	..		..
Ophiura albida Forb.	9.3	2.64	10.0	1.43	9.7	2.04	..		..
— robusta Ayr.	13.6	0.71	8.6	0.36	11.1	0.56	..		..
— affinis Ltk.	12.1	0.43	..	..	6.1	0.22	..		..
Echinocardium cordatum (Penn.) juv.	0.7	0.07	0.7	0.36	0.7	0.22	..		..
Psammechinus miliaris (Gmel.)	1.4	1.57	0.7	0.93	1.1	1.25	..	..	1.25
Haploops tubicola Lillj.	2292.9	37.29	284.3	2.86	1288.6	20.08	20.78	..	..
Byblis gaimardi Kr.	0.7	0.86	..	..	0.4	0.58		..	..
Melita obtusata (Mont.)	0.7		..	..	0.4			..	..
— dentata (Kr.)	0.7		..	..	0.4			..	..
Moera loveni Bruzelius	2.1		2.9	0.29	2.5	..		..	..
Apseudes spinosus M. Sars	..	..	0.7	0.07	0.4	0.04		..	..
Cumacea	1.4	0.07	..	..	0.7	0.04		..	..
Mysis sp.	..	..	0.7	0.07	0.4	0.04		..	..
Hyas coarctatus Leach	0.7	0.36	..	..	0.4	0.18	..	..	0.18
Ostracoda	10.7	0.07	7.9	0.07	9.3	0.07	0.07	..	..
Foraminifera	..	..	0.7	0.07	0.4	0.04	..	..	0.04
Actiniidæ	..	..	1.4	1.07	0.7	0.54	..	..	0.54
Ascidiæ	2.9	1.57	..	..	1.5	0.79	..	..	0.79
I alt / *Total*	84.35 g		25.14 g		54.92 g		34.35 g	14.97 g	5.60 g
1. Kl. Rødspætteføde / *1st Class Plaice Food*	54.92 -		13.57 -		34.35 -		..	..	..
2. Kl. Rødspætteføde / *2nd Class Plaice Food*	20.64 -		9.14 -		14.97 -		..	..	..
Ikke Rødspætteføde / *Not Plaice Food*	8.79 -		2.43 -		5.60 -		..	..	..

Tabel A. Rødspætteføde. 0-Gr. Bu

Vest for Linien Fornæs—Vestenden af Læs

Table A. Plaice Food. The 0-Group of the Bottom Stage. M

West of the Line Fornæs—Western End of Læs

Lokalitet *Locality*		N. for *of* Hals				
		Aalbækbugt	Udfor Asaa *Off*	Aalbækbugt	N. for Frederikshavn *of*	Udfor Asaa *Off*
Dybde i m *Depth in m.*		1/2—1	1/2—1	1/2	1/2	1/2
Aar *Year*		1925	1925	1926	1926	1926
Maaned *Month*		VI		VII		
Dag *Day*		8'	9'	2'	4'	4'
Antal Rødspætter undersøgt *No. of plaice examined*		36	27	5	39	12
Spisula subtruncata (D.C.) 0-gr.		..	..	..	..	..
Cardium edule L. 0-gr.		..	..	..	..	..
Siphoner af *Siphons of*	Lamellibranchia	..	..	1	..	..
Pelagiske Larver af *Pelagic Larvae of*	Lamellibranchia	4	..	..	35	..
Nereis sp. juv.		..	..	..	..	..
Spionidæ		..	..	..	..	..
Naïdæ		..	..	..	..	1.2
Amphipoda		30	..	2	..	4.8
Yngel af *Young of*	Calliopius sp.	..	..	..	..	..
Idothea sp.		..	..	..	..	..
Calanoidea		..	27	..	..	..
Harpacticoidea		..	..	..	..	..
Cladocera		..	..	..	..	..
Ostracoda		..	..	..	4	..
Bodotria pulchella G. O. Sars		2	..	2	..	6
Totalantal af undersøgte Rødspætter *Total No. of Plaice examined*						

et. d.-ten.- og v.-Samfund.
re Rønner Fyr—Skagens Fyrskib.
baltica-, Tellina tenuis-, and Venus-Community.
e Rønner Light—The Skaw Lightship.

t-Indeks Total / *ht-Index Total*	Fre-kvens / *Fre-quency*	S. for *of* Hals: N. for *of* Grenaa Havn	Havnehage (Samsø)	Ebeltoft Vig	Udfor *Off* Havknude	Besser Rev (Samsø)	N. for *of* Grenaa Havn	Hals	Vægt-Indeks Total / *Weight-Index Total*	Fre-kvens / *Fre-quency*
		5	1—4	1/2—1	1/2	1—2	1/2	1	Vægt-Indeks Total / *Weight-Index Total*	Fre-kvens / *Fre-quency*
		1925	1926	1926	1913	1913	1926	1913		
		V			VI			IX		
		13'	25'	25'	26'	27'	30'	10'		
		54	6	19	3	50	67	19		
..	..	..	..	..	..	..	..	17	17 } 19	1
..	..	..	..	..	..	..	..	2	2 }	1
} 40	1	..	..	..	..	..	..	..	..	..
	2	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	4	..	4 } 29	1
..	..	..	..	..	..	25	..	..	25 }	1
.2	1	..	..	..	..	..	..	..	..	..
.8	3	..	..	..	3	..	..	..	3	1
	..	..	1	..	..	..	36	..	37	2
	..	..	..	4	..	..	5	..	9 } 170	2
} 77.8	1	49	5	11	..	..	22	..	87	4
	..	..	..	..	..	12.5	..	..	12.5	1
	..	5	..	4	..	..	..	..	9	2
	1	..	..	..	..	12.5	..	..	12.5	1
	3	..	..	..	..	..	..	..	..	..

Tabel B. Rødspættefød

Syd for Hals, Vest for Linien Fornæs—Vestende

Table B. Plaice Food

South of Hals, West of the Line Fornæs—Western En

Lokalitet *Locality*	S. for Hals *of*	Udfor Als Odde *Off*	Udfor Havknude *Off*	N. for Grenaa Havn *of*	Ø.-Siden af Tangen *Eastern Side of*	Ø. for Boels Plade *E. of*	Udfor Mariager Fjord *Off*
Dybde i m *Depth in m.*	7	3-4	1-2	3½	4-5	7½	3
Aar *Year*	1926	1925	1913	1926	1926	1926	1926
Maaned *Month*	IV	V	VI				
Dag *Day*	14'	15'	26'	30'	30'	30'	30'
Antal Rødspætter undersøgt *No. of plaice examined*	3	2	2	11	50	104	64
Macoma baltica (L.)	..	0.2	..	..	..	..	..
Mya arenaria L. juv.	..	0.6	..	..	..	..	..
Spisula subtruncata (D. C.)	..	..	..	..	33	..	..
Cardium edule L. 0-gr.	..	..	..	..	..	..	..
— fasciatum Mtg.	..	..	..	..	1.5	..	..
Rissoa sp.	..	..	..	..	..	..	..
Philine aperta L.	..	..	..	..	..	21	..
Acera bullata Müll.	..	..	..	..	..	21	..
Phyllodocidæ	0.3	0.2	..	..	..	..	..
Nephthys sp.	1.5	..	..	4.4	12	..	..
Scoloplos armiger (O. F. M.)	0.3	..	..	..	1.5	10	3
Ophelia limacina Rtk.	..	..	..	..	..	10	..
Ammotrypane aulogaster Rtk.	..	..	..	..	..	..	..
Stylarioides plumosa (O. F. M.)	..	..	..	..	..	..	..
Bagender af *Hind parts of* } Arenicola marina L.	0.5	0.4	1	5.5	..	..	61
Pectinaria koreni Mgrn.	..	..	..	1.1	..	10	..
Naidæ	..	0.6	..	..	..	..	..
Ampelisca brevicornis (Costa)	0.4	..	..	..	2	21	..
Bathyporeia pelagica (Sp. Bate)	..	..	..	..	..	5	..
Phoxocephalus holbølli (Kr.)	..	..	..	..	..	6	..
Pontoporeia femorata Kr.	..	..	..	..	..	..	..
Gammarus locusta L.	..	..	..	..	..	..	..
Mysidæ	..	..	1	..	..	..	..
Crangon vulgaris Fabr.	..	..	..	..	..	..	..

Gr. Venus-Samfund.

Læsø—Nordre Rønner Fyr—Skagens Fyrskib.

roup. Venus-Community.

Læsø—Nordre Rønner Light—The Skaw Lightship.

Mariager Fjord *Off*	S. for Hals *of*	Udfor Mariager Fjord *Off*	N. for Tangen *of*	Udfor Mariager Fjord *Off*	S. for Hals *of*	2½ Sm. S.O.t.S. for Hals *mil. S.E.byS. of*	Ebeltoft Vig	N. for Grenaa Havn *Harbour*	Hals	S. for Hals *of*	Vægt-Index Total *Weight-Index Total*		Frekvens *Frequency*
8	7	7	13	10	5	5	3½	5	1	4			
926	1926	1926	1926	1926	1926	1929	1924	1929	1913	1912			
			VII			VIII	IX						
1'	1'	7'	13'	13'	13'	8'	5'	6'	10'	25'			
16	40	46	6	23	84	74	4	4	2	18			
.	..	..	..	..	..	..	..	..	..	..	0.2		1
.	..	..	..	..	..	..	..	..	..	..	0.6		1
.	..	..	..	..	51	25	3	3.2	1	17.1	133.3	136.1 (24.6 %)	7
.	..	..	..	..	..	..	..	..	0.5	..	0.5		1
.	..	..	..	..	..	..	..	..	..	..	1.5		1
.	..	..	..	..	..	..	1	..	..	..	1		1
.	..	..	..	..	..	..	..	..	..	..	21	43	1
.	..	..	..	..	..	..	..	..	..	..	21		1
.	..	..	..	..	8	..	..	..	..	..	8.5		3
6	24	32.2	2.7	8	17	25	..	0.4	..	0.9	144.1		12
.	2	..	2.4	7	..	12	..	..	..	..	38.2		8
.	..	4.6	..	..	8	..	..	..	..	..	22.6		3
.	..	4.6	..	..	..	..	..	..	..	..	4.6	335.3	7
.	8	..	..	..	..	..	..	..	..	..	8	(60.6 %)	1
.	2	4.6	..	8	..	..	..	0.1	0.3	..	83.4		10
.	2	..	..	..	..	12	..	0.2	..	..	25.3		5
.	..	..	..	..	..	..	..	..	..	..	0.6		1
.	2	..	0.6	..	..	..	..	..	..	..	26		5
.	..	..	..	..	..	..	..	..	..	..	5		1
.	..	..	..	..	..	..	..	..	..	..	6		1
.	..	..	0.3	..	..	..	..	..	..	..	0.3	38.6	1
.	..	..	..	..	..	..	..	0.1	..	..	0.1	(7.0 %)	1
.	..	..	..	..	..	..	..	..	..	..	1		1
.	..	..	..	..	..	..	..	..	0.2	..	0.2		1

Totalantal undersøgte Rødspætter } 553
Total No. of Plaice examined }

Tabel C. Rødspættefød
Nord for Hals, Vest for Linien Fornæs—Vestenden

Table C. Plaice-Food.
North of Hals, West of the Line Fornæs—Western End

Lokalitet *Locality*	Aalbækbugt	Dvalegrundene	Aalbækbugt	Læsø Rende	Udfor Asaa *Off*
Dybde i m *Depth in m.*	6—15	8	1/2—1	12	1/2—1
Aar *Year*	1922	1925	1925	1925	1925
Maaned *Month*	IV				VI
Dag *Day*	4'	6'	8'	8'	9'
Antal Rødspætter undersøgt *No. of plaice examined*	10	11	21	13	3
Macoma baltica L.	..	..	..	..	..
Tellina fabula Grow.	1.5	..	..	..	..
Cultellus pellucidus (Penw.)	1.5	..	..	2	..
Spisula subtruncata (D. C.) 0-gr.	..	..	..	..	..
Montacuta ferruginosa (Mtg.)	..	..	..	..	..
Nucula tenuis (Mtg.)	..	..	..	..	..
Hydrobia sp.	..	..	..	..	1
Nephthys sp.	..	10	..	6	..
Nereis sp. (pelagica L.?)	..	..	..	..	..
Scoloplos armiger (O. F. M.)	..	..	..	3	..
Ophelia limacina Rtk.	..	1	..	..	..
Ammotrypane aulogaster Rtk.	..	..	..	1	..
Travisia forbesi Rtk.	..	..	..	..	..
Bagender af *Hind parts of* Arenicola marina L.	..	..	..	..	0.5
Pectinaria koreni	..	..	..	..	..
Snabler af *Trunks of* Echiurus ech. Pall.	..	..	..	1	..
Naidæ	..	..	..	..	..
Nemertini	..	..	..	..	..
Amphipoda (mest *(chiefly)* Ampelisca brevicornis)	7	..	18	..	1.5
Bodotria pulchella G. O. Sars	..	..	3	..	..

ir. Venus-Samfund.
Læsø—Nordre Rønner Fyr—Skagens Fyrskib.
roup. Venus-Community.
æsø—Nordre Rønner Light—The Skaw Lightship.

S.E. of Aalbæk	Udfor Aalbæk Off	Aalbækbugt	Aalbækbugt	Aalbækbudt	Aalbækbugt	for N. of Grenen	Udfor Asaa Off	Udfor Asaa Off	2 Sm. O.N.O. for 2 miles E.N.E. of Hov	Vægt-Index Total *Weight-Index Total*		Frekvens *Frequency*
10	7	13	11½	½	13	10—31	½	6½	6			
923	1922	1926	1926	1926	1926	1926	1926	1926	1929			
		VII							VIII			
25'	26'	2'	2'	2'	2'	3'	4'	4'	9'			
34	3	88	106	46	52	38	10	25	18			
..	..	..	..	..	..	..	..	1.4	..	1.4		1
..	0.5	..	..	..	20.8	..	..	..	..	22.8		3
..	..	..	..	..	2.6	7.6	..	1.4	..	15.1	143.2	5
..	0.5	53	35	..	..	..	..	..	9	97.5	(28.2 %)	4
..	..	..	..	..	2.6	..	..	..	..	2.6		1
..	..	..	..	..	..	3.8	..	..	..	3.8		1
..	..	..	..	..	..	..	7	..	..	8		2
..	2	26	..	..	5.2	15.2	..	12.5	3.6	80.5		8
13	..	..	..	..	..	..	..	..	..	13		1
..	..	..	..	..	..	3.8	..	..	..	6.8		2
..	..	..	..	10	..	..	..	..	..	11		2
..	..	..	..	..	10.4	..	..	..	..	11.4		2
..	..	..	9	..	..	..	..	..	..	9		1
..	..	..	4	..	..	7.6	2	8	..	22.1	271.6 (53.3 %)	5
..	..	..	58	..	5.2	..	..	..	3.6	66.8		3
..	..	..	..	..	..	..	..	..	..	1		1
..	..	..	..	36	..	..	..	..	..	36		1
..	..	9	..	..	2.6	..	..	..	1.8	18.4		3
51	..	..	..	..	2.6	..	1	1.7	..	82.8	85.8	7
..	..	..	..	..	..	..	..	..	..	3	(16.9 %)	1

Totalantal af undersøgte Rødspætter
Total of No. Plaice examined } 508

Tabel D. Rødspætteføde. II-Gr

Syd for Hals, Vest for Linien Fornæs—Vestenden

Table D. Plaice-Food. The II-Group and

South of Hals, West of the Line Fornæs—Western End

Lokalitet *Locality*	S. f. *of* Tangen	N. f. *of* Grenaa Havn *Harbour*	S. f. *of* Hals	Sm. S.V.f. $6^1/_2$ *Miles S.W. of* Ostre Flak	Udf. Mariager Fjord *Off*	Udf. Mariager Fjord *Off*	Sm. O.t.S.f. 15 *Miles E. by S. of* Als Odde	N.O. f. *N.E. of* Fjellerup Flak	O.S.O.f. *E.S.E. of* Hevring Flak	Hevring Flak	Udf. Randers Fjord *Off*	S. f. *of* Tangen	Udf. Grenaa *Harbour Off*	Sm. S.O. f. $1^1/_2$ *Miles S.E. of* Havknude	Sm. Ø. f. $2^1/_2$ *Miles E. of* Fornæs	N f. *of* Grenaa *Harbour*	Sm. N.N.O. f. 2 *Miles N.N.E. of* Treaa Mølle
Dybde i m *Depth in m.*	5-8	5	5	13	14	$3^1/_2$	$11^1/_2$	$7^1/_2$	8	$4^1/_2$	8	9	5	19	17	4	10
Aar *Year*	1922	1925	1927	1927	1927	1927	1927	1927	1927	1927	1927	1912	1921	1913	1913	1913	1913
Maaned *Month*	IV	V															
Dag *Day*	7'	3'	5'	5'	5'	5'	6'	8'	8'	8'	8'	22'	24'	28'	28'	28'	29'
Antal Rødspætter undersøgt *No. of Plaice examined*	2	55	111	6	8	34	22	2	3	3	8	22	20	10	4	16	11
Aldersgruppe *Age-Group*	3	2	2	2	2	2	2	2	3	2	2	2-5	2-8	3-5	3-5	2-5	3-4
Macoma calcarea (Chem.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
— baltica (L.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.1	..
Tellina fabula Gron.	..	..	..	2.4	..	..	..	..	..	..	..	..	..	..	0.1	0.1	..
— tenuis D. C.	..	..	..	..	..	3.4	..	..	..	..	..	..	..	..	..	..	..
Mya arenaria L. juv.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
— — Siphoner	..	..	..	..	..	3.4	..	..	..	..	..	..	..	..	..	..	..
Cultellus pellucidus (Penn.)	..	..	..	1.2	0.6	..	19.8	..	..	..	..	..	..	0.1	..	..	..
Spisula subtruncata (D. C.)	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Venus gallina (L.) juv.	..	..	..	..	..	..	..	..	..	..	..	..	..	0.1	0.1	..	..
Montacuta ferruginosa (Mtg.)	..	6	..	..	..	..	..	..	..	..	..	..	..	..	0.1	..	..
Lacuna divaricata Fabr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Hydrobia sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Philine aperta L.	0.1	..	37	..	..	..	..	..	..	..	..	2.2	..	..	..	..	..
Acera bullata Müll.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Phyllodocidæ	0.8	..	19	..	0.5	..	0.7	..	..	1.5	..	..	..	1	0.4	..	..
Nephthys sp.	0.1	6	9	0.6	6.4	3.4	0.7	0.1	0.2	..	3	2.2	2	4	2.4	14.2	0.6
Goniada maculata Ørst.	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Scoloplos armiger (O. F. M.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophelia limacina Rthke.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ammotrypane aulogaster Rthke.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.4	..	..
Travisia forbesi Rthke	..	..	..	..	..	..	..	..	..	..	..	..	..	2.8	..	..	..
Stylarioides plumosa (O. F. M.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Arenicola marina L.	..	29	9	..	..	6.8	..	0.1	2.8	..	1.6	15.2	6	1	..	0.8	9.9
Pectinaria koreni Mgr.	0.9	11	37	..	..	17	..	..	..	..	..	2.2	6	..	..	0.8	..
Terebellidæ	..	..	..	0.3	..	..	..	..	..	..	..	..	..	..	0.5	..	..
Nemertini	..	..	..	0.3	..	..	..	0.2	..	..	..	0.1	..	..	..	..	..
Echinocardium cordatum (Penn.) juv.	..	..	..	..	..	..	..	..	..	..	..	0.1	..	..	..	..	..
Echinocyamus pusillus (O. F. M.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ampelisca brevicornis (D. C.)	..	..	..	1.2	0.5	..	0.8	1.6	..	..	..	..	..	..	..	..	0.5
Caprella septentrionalis Kr.	..	..	..	..	..	..	..	..	..	1.5	..	..	..	..	..	..	..
Andre *Other* Amphipoda	..	..	..	..	..	..	..	..	..	..	3.4	..	..	..	..	..	..
Idothea baltica (Pallas)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Diastylis rathkei Kr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Carcinus mænas Leach.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Stenorhynchus rostratus L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Hydroidæ	0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ammodytes sp.	..	..	..	..	..	..	..	..	..	..	..	..	6	..	..	..	..
Glasaal *Elvers*	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

ældre. Venus-Samfundet.
Læsø—Nordre Rønner Fyr—Skagens Fyrskib.
r Individuals. Venus-Community.
æsø—Nordre Rønner Light—The Skaw Lightship.

	S.O. f. *of* Als Odde	N. f. *of* Tangen	S. f. *of* Hals	Udf. Als Odde *Off*	N. f. *of* Grenaa Havn *Harbour*	Fjellerup Flak	Østsiden af *Eastern Side of* Tangen	Udf. Mariager Fjord *Off*	S. f. *of* Hals	1 Sm. N.W. f. *Mile N.W. of* Gaasehage	9 Sm. O.N.O. f. *Miles E.N.E. of* Als Odde	4 Sm. S.O. f. *Miles S.E. of* Muldbjergene	2½ Sm. S.S.O. f. *Miles S.S.E. of* Muldbjerggrund	½ Sm. S.O. f. *Mile S.E. of* Muldbjerggrund	Udf. Mariager Fjord *Off*	N. f. *of* Tangen	S. f. *of* Hals	Ø. f. *E. of* Muldbjerggrunden	S.O. f. *S.E. of* Muldbjerggrunden	2½ Sm. S.O. t. S. f. *Miles S.E. by S. of* Hals	N. f. *of* Gjerrild Fyr *Light*	Vægt-Index Total *Weight-Index Total*		Frekvens *Frequency*
	6	13½	4-5	3½	4	7½	4-5	8-9	7	3½	9½	6	8	6	7	13	5	8	12	5	13			
3	1913	25	25	23	26	26	26	26	26	27	27	27	27	27	26	26	26	13	13	29	12			
		VI						VII												VIII				
	30'	6'	9'	21'	30'	30'	30'	1'	1'	4'	6'	6'	6'	6'	7'	13'	13'	18'	24'	8'	29'			
	11	1	79	55	2	3	5	30	22	1	7	6	12	49	68	2	5	19	2	7	2			
	2-3	2	2-3	2-3	3	3	2	2-3	2-3	2	2	2	2	2	2-3	2	2	2	3-4	2	5-6			
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.4	0.4			1
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.1			1
1		..	..	..	..	0.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.4	3.9			6
		0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3.5			2
		..	..	20	..	..	..	..	..	0.1	..	..	..	..	..	..	..	..	..	..	..	20.1	71.9		2
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3.4			1
		..	..	..	..	..	..	..	..	..	0.4	..	..	..	..	..	..	..	..	..	..	22.1			5
		..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	3	0.1	..	2.3	10.4			5
		..	..	..	..	..	..	1.5	..	..	..	..	..	..	..	..	..	..	0.1	0.1	..	1.9			5
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6.1			2
		..	..	..	..	..	..	..	..	..	..	..	..	..	3.4	..	..	..	..	..	..	3.4			1
		..	..	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20.0	86.5		1
		..	..	20	..	..	..	..	..	..	..	..	..	..	3.4	..	..	..	..	..	..	62.7			5
		..	..	..	..	..	..	..	..	..	0.4	..	..	..	..	..	..	..	..	..	..	0.4			1
		..	..	4	..	..	..	..	..	..	0.7	..	..	..	..	..	0.5	..	..	..	0.2	29.3			11
		2.2	1	10	11	..	0.6	1	17	13	0.1	2.7	..	1.2	6	40.8	0.9	1	0.8	0.2	2.3	0.7	167.4		35
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1			1
		..	..	..	..	..	0.6	..	..	1	..	..	..	..	..	..	0.8	..	..	..	1.2	..	3.6			4
		2.2	..	..	11	..	..	..	1.5	..	..	..	..	1.2	5	6.8	..	0.5	0.1	..	..	..	28.3			8
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.4	497.8		1
		2.2	..	..	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14	(68.1 %)		3
		..	..	..	..	..	..	..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	4			1
8		4.2	..	..	9	2	1	..	6	1	0.8	..	3.6	..	6	6.8	..	..	0.9	..	..	..	129.3			23
		..	..	..	11	..	..	..	..	1	..	..	2.4	4.8	20	..	..	..	..	..	1.2	..	115.3			13
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.6	..	..	2.4			3
		..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	0.2	2.8			5
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.1			1
		0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	6.8	..	..	..	..	..	..	6.9	7		2
1		..	..	5	..	..	..	1	2	2	..	2.8	..	2.4	..	..	0.3	..	17	0.1	..	0.1	37.4			16
		.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.5			1
		..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	5.4	60.7		2
		.	..	..	..	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	5			1
		..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4			1
		..	..	..	..	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	5			1
		..	..	..	..	..	..	..	..	..	..	..	..	2.4	..	..	..	..	..	..	..	..	2.4			1
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.1	0.1		1
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	7		1
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1			1

Totalantal af undersøgte Rødspætter / *Total No. of Plaice examined* 731

Tabel E. Rødspætteføde. II-Gr. og ældre. Overvejende

Nord for Hals, Vest for Linien Fornæs—Vestenden

Table E. Plaice-Food. The II-Group and older Individuals. Chiefly

North of Hals, West of the Line Fornæs—Western End

Lokalitet *Locality*	Aalbækbugten	12 Sm. Ø. f. *Miles S. of* Hov	2 Sm. Ø. f. *Miles S. of* Nordmands Hage	Ø. f. *E. of* Middelgrunden	Dvalegrunden	Aalbækbugten	Aalbækbugten	Aalbækbugten	S.O. f. *S.E. of* Aalbæk	Aalbækbugten	Aalbækbugten	S.O. f. *S.E. of* Aalbæk	Udf. *Off* Strandby	N. f. *N. of* Hirsholmene	S.O. f. *S.E. of* Aalbæk	Dvalegrunden	Dvalegrunden	—Aalbækbugten	Aalbækbugten
Dybde i m *Depth in m.*	6-15	13	7	13	8	15	12½	6½	12	19	19	10	8	18½	11	8	7	13	11½
Aar *Year*	1922	1927	1927	1911	1925	1925	1925	1925	1923	1923	1923	1923	1922	1922	1922	1923	1926	1926	1926
Maaned *Month*	IV	V			VI														
Dag *Day*	5'	4'	4'	23'	6'	7'	7'	7'	25'	25'	25'	25'	26'	26'	26'	28'	1'	2'	2'
Antal Rødspætter undersøgt *No. of Plaice examined*	137	4	16	11	10	12	155	3	22	34	29	36	15	25	17	24	13	29	37
Aldersgruppe *Age-Group*	2-7	2	2	2-3	3-4	2-3	2-3	2-3	2-3	2-3	2-5	2-3	2-3	2-4	2-3	2-4	2-3	2	2-4
Syndosmya nitida (Müll.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Tellina fabula Gron.	51	..	..	1.3	..	7	108	..	..	7	10	..	2	..	9	..	..	..	..
Cultellus pellucidus (Penn.)	51	..	..	1.3	1	1	..	..	..	14	5	..	..	8	3	2	1.3	..	..
Ensis ensis (L.)	..	..	..	..	..	..	..	0.8	..	..	..	..	..	..	..	..	1.3	..	6
Spisula subtruncata (D. C.) 0-gr.	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	17.4	13
Venus gallina (L.) juv.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.'	..	..
Montacuta bidenta (Mtg.) & ferruginosa (Mtg.)	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..
Nucula nitida Sowb. & tenuis (Mtg.)	..	..	..	..	..	..	..	..	..	..	..	..	2	4	..	2	..	..	..
Lacuna sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Rissoa sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Natica sp.	..	..	..	..	..	..	..	..	..	..	..	7.2	..	..	..	..	..	..	..
Cylichna sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Philine aperta L.	..	..	..	0.1	..	..	..	..	..	..	5	7.2	..	..	..	..	..	..	..
Phyllodocidæ	..	..	1.6	2	2	..	8	0.7	7	..	..	..	..	..	..	2	..	..	..
Nephthys sp.	27	2	2.4	4	2	4	31	0.8	..	6	5	..	5	4	2	5	5.2	8.7	..
Nereis sp.	..	..	..	..	..	..	..	..	..	..	..	12	..	..	..	..	..	..	..
Goniada maculata Ørst.	..	..	..	..	0.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Scoloplos armiger (O. F. M.)	..	..	0.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophelia limacina Rtk.	..	..	0.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ammotrypane aulogaster Rtk.	..	1	..	2	1	..	8	..	..	..	..	..	..	..	..	..	0.6	..	..
Travisia forbesi Rtk.	..	..	..	..	..	..	..	..	4	..	..	..	..	..	..	..	..	..	3
Eumenia crasia Ørst.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Arenicola marina L.	..	..	0.8	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..	1
Notomastus latericius Sars	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.6	..	..
Pectinaria koreni Mgrn.	..	..	1.6	0.1	..	..	..	..	7	..	4	7.2	..	3	..	..	..	..	14
Terebellidæ	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Maldanidæ	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Andre *Other* Polychæta	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Echiurus-*Trunks* Snabler	..	1	..	..	0.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Nemertini	..	..	..	0.1	1	..	..	0.7	..	..	..	1.2	..	4	1	2	..	2.9	..
Planariæ	..	..	..	..	..	..	..	..	..	..	..	1.2	..	..	..	..	..	..	..
Arme af *Arms of* Amphiura sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..
Ophiura affinis Ltk.	..	..	1.6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ampelisca, mest (*chiefly*) A. brevicornis (D. C.)	..	..	6.4	0.1	..	..	..	..	..	7	..	..	..	..	2	..	..	..	..
Idothea sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Diastylis sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Portunus sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Eupagurus sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Crangon sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1.3	..	..
Ammodytes sp.	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	7	..	..	..
Gobius minutus	..	..	..	..	..	..	..	..	4	..	..	..	..	..	..	..	..	..	..

nus-Samfund; enkelte Steder Amphiura filiformis-Samfund.
Læsø—Nordre Rønner Fyr—Skagens Fyrskib.
nus-Community; in some few places Amphiura filiformis-Community.
Læsø—Nordre Rønner Light—The Skaw Lightship.

	Aalbækbugten	Aalbækbugten	N. f. Grenen *N. of*	Udf. Asaa *Off*	N.V. f. Nordre Rønner *N.W. of*	Ø. f. Nordmands Hage *E. of*	Sm. S. t. V. f. Læsø Rende Fyrsk. 3 *Miles S. by W. of*	Sm. S.O. f. Sæby 2 *Miles S.E. of*	Sm. N.V. f. Nordvestrevet 2 *Miles N.W. of*	Sm. S.O. f. Frederikshavn 4 *Miles S.E. of*	Sm. Ø. f. Hirsholmene 2 *Miles E. of*	Sm. N.O. t. O. f. Hirsholmene 6½ *Miles N.E. by E. of*	Sm. S.O. f. Skagens Fyr 3 *Miles S.E. of*	Sm. S.S.O. f. Skagens Havn 1 *Miles S.S.E. of* *Harbour*	Sm. S.S.O. f. Skagens Havn 4½ *Miles S.S.E. of* *Harbour*	Sm. V.S.V. f. 4 *Miles W.S.W. of* Aalbæk	Sm. N.O. f. 1 *Mile N.E. of* Aalbæk	Sm. S.O. t. O. f. 4½ *Miles S.E. by E. of* Aalbæk	Sm. O.N.O. f. 2 *Miles E.N.E. of* Hov	Sm. V.N.V. f. 4½ *Miles W.N.W. of* Nordre Rønner	Sm. N. t. O. f. 3 *Miles N. by E. of* Nordre Rønner	Udf. Aalbæk *Off*	Udf. Sæby *Off*	Vægt-Index Total *Weight-Index Total*		Frekvens *Frequency*
2½	23½	13	c. 20	6½	30	5	11	6	17½	15	30	28	22	15	20	11	6½	13	6	30	10	5	4			
26	1926	1926	1926	1926	1926	1927	1927	1927	1927	1927	1927	1927	1927	1927	1927	1927	1927	1927	1929	1929	1912	1912	1912			
	VII																		VIII			IX				
'	2'	2'	3'	4'	5'	6'	7'	7'	7'	7'	9'	9'	9'	10'	10'	10'	10'	10'	9'	10'	31'	3'	5'			
3	2	12	15	5	1	130	10	95	35	86	2	12	16	74	58	167	165	237	9	1	23	50	18			
4	2-3	2	2-4	2	2	2	2	2	2	2	2	2	2	2-3	2	2	2-3	2	2-3	3	2-5	2-3	2-4			
..	0.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.2		1
.	..	4.8	..	..	..	..	..	..	..	..	..	..	..	..	11.6	..	41	24	..	..	..	..	..	276.7		12
6	1.8	0.6	1.5	0.5	..	..	..	..	14	17	..	1.2	..	44.4	11.6	66	..	118	..	..	..	..	..	400.2		22
..	..	..	1.5	..	..	..	..	..	..	..	1.5	..	..	..	11.6	66	41	59	..	..	..	..	..	188.7	1163.6	9
.4	..	..	..	..	..	65	..	47	..	..	..	..	..	..	11.6	..	..	..	4.5	..	21.8	47.5	17.4	248.6	(61.4 %)	11
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.7		1
.	..	0.6	..	..	..	..	..	..	..	..	..	..	0.8	..	..	8.7	..	..	..	..	..	..	..	12.1		4
.4	..	..	1.5	..	..	..	..	..	..	13	..	..	..	3.7	..	8.8	..	..	..	..	..	..	..	36.4		8
.	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	0.2	..	..	5.2		1
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.2	..	..	0.2		1
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.8	..	8.0	43.5	2
.	..	..	..	..	..	..	..	..	..	..	..	..	0.8	..	..	..	..	..	..	..	..	..	..	0.8	(2.3 %)	1
.	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..	..	..	..	..	..	..	..	..	29.3		4
.	..	..	..	..	..	..	0.5	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	28.8		9
.	..	1.2	6	2.5	..	13	9	19	3.5	..	..	..	4	22.2	3.9	8.8	41	12	1.8	..	..	0.9	0.2	263.1		32
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	12.0		1
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.5		1
.	..	..	1.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.3		2
.	..	..	..	..	..	13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13.8		2
.	..	2.4	..	..	..	..	..	..	..	..	..	..	..	3.7	..	..	..	..	..	..	..	..	..	18.7		7
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7.0		2
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.5	..	..	..	0.5		1
.	..	..	3	1.7	..	6.5	..	5	..	..	..	..	..	..	..	..	..	..	..	..	0.3	..	0.2		22.5	589.5	9
.	..	..	..	..	..	..	..	..	14	34	..	..	5.3	..	3.9	..	..	..	..	..	..	..	..	59.8	(31.1 %)	5
.	..	1.2	..	..	..	32.5	0.5	9	..	..	..	..	..	..	3.8	..	33	..	1.8	..	..	0.8	0.2	119.7		16
.	..	..	..	..	..	..	..	..	..	..	..	10.2	..	..	..	..	..	..	..	..	..	..	..	10.2		1
.	..	..	..	..	..	..	..	..	1.7	..	..	..	2.7	..	..	..	..	..	..	..	..	..	..	4.4		2
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.5	..	..	..	8.5		2
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.5		2
.	..	0.6	..	..	..	..	..	..	..	..	..	0.6	..	..	..	..	..	..	0.9	..	..	..	..	15.0		11
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.2		1
.	..	..	..	..	1	..	..	..	..	..	0.5	..	0.8	..	..	..	..	..	..	..	..	..	..	4.3	5.9	4
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.6		1
.4	..	0.6	..	0.3	..	..	..	..	1.8	..	..	..	0.8	..	..	8.7	9	24	..	..	0.2	..	..	62.3		13
.	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5.0		1
.	..	..	..	..	..	..	..	..	..	..	..	..	0.8	..	..	..	..	..	..	..	..	..	..	0.8	79.5	1
.	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	5.0	(4.1 %)	1
.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.8		1
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.3	..	..	3.6		3
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9.0	13	2
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4.0		1

Totalantal af undersøgte Rødspætter / *Total No. of Plaice examined* 1895

Tabel F. Rødspættefød
Øst for Linien Fornæs—Vestenden a
Table F. Plaice Food
East of the Line Fornæs—Western End o

Samfund / *Community*	Venus									Venus		
Lokalitet / *Locality*	2½ Sm. N.f. Schultz's Gr.'s Fyrsk. *Miles N. of Lightship*	Ø.f. Hastens Grund *E. of*	6½ Sm. N.f. Anholt Fyr *Miles N. of Light*	5 Sm. N.f. Lysegrund *Miles N. of*	12 Sm. V.N.V.f. Anholt Havn *Miles W.N.W. of Harbour*	22 Sm. N.t.O.f. Fornæs *Miles N. by E. of*	N.V.f. Anholt Knob *N.W. of*	Vægt-Index Total / *Weight-Index Total*	Frekvens / *Frequency*	5 Sm. N.V.f. Schultz'sGr.'s Fyrsk. *Miles N.W. of Lightship*	12½ Sm. N.f. Hesselø *Miles N. of*	7 Sm. N.N.O.f. Anholt Fyr *Miles N.N.E. of Light*
Dybde i m / *Depth in m.*	11	18	17	26	15	13	60			22	26	28
Aar / *Year*	1913	1913	1927	1912	1912	1912	1922			1913	1927	1912
Maaned / *Month*	V			VI			VII			V		
Dag / *Day*	14'	27'	27'	6'	7'	7'	24'			14'	24'	7'
Antal Rødspætter undersøgt / *No. of Plaice examined*	16	11	2	1	1	1	2			3	1	1
Aldersgruppe / *Age-Group*	3-6	3-6	2	4	?	ca. 6	6-8			3-4	4	ca. 6
Macoma calcarea (Chem.) ad.	..	0.1	..	..	..	..	..	0.1	1	1.5	..	..
Tellina fabula Gron.	..	..	..	..	..	0.1	..	0.1	1	..	..	..
Mya truncata L. juv.	3.8	..	..	..	..	..	..	3.8	1	..	..	..
Corbula gibba Olivi	..	..	..	..	..	..	..	..	..	..	..	..
Cultellus pellucidus (Penn.)	..	0.1	1	..	..	0.1	..	1.2	3	..	..	..
Mactra sp.	..	..	..	..	0.1	..	..	0.1	..	..	..	..
Psammobia færöensis (Chemn.)	..	..	..	..	..	..	..	.. (10 (29.4 %))	..	..	..	..
Venus gallina (L.) juv.	0.1	..	..	..	..	..	..	0.1	1	..	..	..
Cardium fasciatum Mtg.	2	..	..	..	..	..	..	2	1	..	..	..
Cyprina islandica L. juv.	2	..	..	..	0.1	0.1	..	2.2	3	..	..	..
Montacuta sp.	..	..	..	..	..	..	..	..	..	..	..	..
Nucula sp.	..	0.1	..	0.3	..	..	..	0.4	2	..	..	..
Cylichna sp.	..	..	..	..	..	..	..	..	..	..	..	..
Polychæta	..	..	..	0.7	..	..	..	0.7	1	..	..	..
Aphrodite aculeata L.	..	..	..	..	..	..	..	..	..	..	..	..
Phyllodocidæ	..	2.1	..	..	..	..	..	2.1	1	..	..	..
Nephthys sp.	3	2.2	1	..	..	0.7	..	6.9	4	..	..	..
Lumbrinereis fragilis Ehl.	..	..	..	..	..	..	..	..	..	..	..	..
Glycera sp.	..	..	..	..	..	..	..	..	..	..	..	..
Ophelia limacina Rthke	5	..	..	..	0.3	..	..	5.3	2	..	..	..
Ammotrypane aulogaster Rthke.	..	4.4	..	..	..	..	..	4.4	1	..	..	..
Travisia forbesi Rthke	..	1	..	..	0.4	..	..	1.4 (23.9 (70.3 %))	2	..	..	..
Eumenia crassa Ørst.	..	..	..	..	..	..	..	..	..	..	..	..
Arenicola marina L.	0.1	..	..	..	..	..	..	0.1	1	..	..	..
Notomastus latericius Sars	..	..	..	..	..	..	2	2	1	..	..	..
Maldanidæ	..	..	..	..	..	..	..	..	..	..	0.1	..
Pectinaria sp.	..	..	..	..	..	..	..	..	..	0.8	..	0.3
Terebellidæ	..	1	..	..	..	..	..	1	1	..	..	..
Terebellides strømi Sars	..	..	..	..	..	..	..	..	..	0.7	0.5	..
Nemertini	..	..	..	..	..	..	..	..	..	..	..	0.6
Amphiura filiformis (O. F. M.)	..	..	..	..	..	..	..	..	..	..	0.4	0.1
Amphipoda	..	..	..	..	..	..	..	..	..	..	..	..
Amphioxus lanceolatus Pall.	..	..	..	..	0.1	..	..	0.1	1	..	..	..
Totalantal af undersøgte Rødspætter / *Total No. of Plaice examined*	34											

Gr. og ældre.
sø—Nordre Rønner Fyr—Skagens Fyrskib.
Group and older Individuals.
ø—Nordre Rønner Light—The Skaw Lightship.

	Amphiura filiformis												Brissopsis-Amphiura chiajei				
	V. f. *W. of* Hesselo	S.O. t. O. f. *S.E. by E. of* Flyndergrund	Färlefjord	Sm. S. 1/4 V. f. 10 *Miles S. 1/4 W. of* Anholt	Sm. V. 1/2 N. t. 7 *Miles W. 1/2 N. of* Hesselø Fyr *Light*	N. f. Herthas Flak *N. of*	Sm. S.O. f. 11 Skagens Fyr *Light Miles S.E. of*	Sm. S.O. f. 5 1/2 Skagens Fyr *Light Miles S.E. of*	Ved Hesselø *at*	Ved Hesselø *at*	Vægt-Index Total *Weight-Index Total*	Frekvens *Frequency*	Gullmarsfjorden	N. f. Lille Middelgrund *N. of*	Ø. f. Anholt *E. of*	Vægt-Index Total *Weight-Index Total*	Frekvens *Frequency*
	22	28	19	22	22	29	30	25	23	23			80	25	33		
19	1911	1911	1911	1913	1912	1911	1927	1927	1919	1919			1911	1926	1922		
	VI					VII							VI	VII			
"	20'	21'	24'	25'	28'	7'	9'	9'	12'	12'			24'	6'	24'		
	7	5	7	4	10	14	2	19	1	4			1	1	1		
	2-4	2-4	2-5	3	2-6	2-6	2	2	4	3-4			2	3	ca. 15		
.	..	..	..	..	..	..	..	..	..	..	1.5	1	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..
.	..	..	..	..	..	..	0.2	..	..	..	0.2	1	..	..	..	..	..
.	0.5	3	..	..	..	..	..	..	..	..	3.5	2	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	..	..	8.8 (11.1 %)	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	..	..		..	0.9	..	0.9 1	1
.	..	..	..	..	..	..	0.1	..	..	..	0.1	1	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..
.	..	..	..	..	..	..	0.1	..	..	..	0.1	1	..	..	..	..	..
.	0.5	..	..	..	..	..	..	..	..	..	0.5	1	..	..	..	..	..
.	0.5	..	..	..	2	..	..	..	..	0.4	2.9	3	..	0.1	..	0.1	1
.	..	..	..	..	0.1	..	..	..	..	..	0.1	1	..	..	..	..	..
.	..	1	5.5	..	..	5.6	..	..	..	..	12.1	3	..	..	..	..	..
.	..	..	..	..	..	..	..	3.8	..	..	3.8	1	..	..	0.4	0.4	1
.	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..
.7	2	..	..	3.8	4	..	..	1.9	..	0.8	13.2	6	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	1.6	1.6	1	..	..	..	..	..
.	..	..	..	0.1	..	..	..	3.8	..	..	3.9	2	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..
.	..	..	..	..	3.8	..	..	..	..	..	3.8	1	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	..	..	55.7 (70.5 %)	..	..	..	.. 2	..
.	..	..	..	..	..	7	..	..	1	..	8	2	..	..	0.4	0.4	1
.	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..
.	..	..	..	..	..	..	..	1.9	..	..	1.9	1	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	..	0.1	1	1	..	..	1	1
.	3	..	..	..	..	..	..	..	..	..	4.1	3	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	1.2	1.2	1	..	..	0.1	0.1	1
.	..	..	..	..	..	..	..	..	..	..	1.2	2	..	..	..	..	..
.	..	..	..	0.1	0.1	..	..	..	..	..	0.8	3	..	..	0.1	0.1	1
.3	..	..	1.4	..	..	1.4	1.6	7.6	..	..	12.8	7	..	..	..	..	..
.	0.5	1	0.1	..	..	..	..	..	..	..	1.6	3	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Totalantal af undersøgte Rødspætter *Total No. Plaice examined* 79 | 3

II.

The Sprat (*Clupea sprattus* L.) in the Limfjord.

By

A. C. JOHANSEN

Sprats in the Limfjord are caught together with the young herring ("silding") with fine-meshed seines and pound nets and were sold there for many years together with the "silding" at a very low price. Sprats are now for the most part separated from the "silding" and sold at a much higher price.

In 1919 for the first time, and since that year, data as to the sprat catch in the Limfjord have been collected in the "Fiskeri-Beretning" or in the archives of the Danish Board of Fisheries. The catches for the years 1919—1929 are given in Table 1. From this it appears that the catch is as a rule larger in District B than in District A, whilst no appreciable number of sprats are caught in District C. (For the delimitation of Districts A, B and C see Fig. 1).

The difference in price between the sprat and the "silding" in the Limfjord is very great. As is shown in Table 1, the price of sprats during the years 1925—1929 amounted to 18—24 øre per kilogram, while the price of "silding" during the same period was only 3—5 øre per kilogram.

Table 1. Yield of the sprat catch in the Limfjord during the years 1919—1929.

Year	Distr. A		Distr. B		Total		Price in Kr.
	Tons	Kroner	Tons	Kroner	Tons	Kroner	pr. kg.
1919	..	..	86	34 400	86	34 400	0,40
1920	5	5 500	22	21 950	27	27 450	1,00
1921	5	3 000	21	12 480	26	15 480	0,60
1922	3	1 240	38	15 200	41	16 440	0,40
1923	2	750	73	21 900	76	22 650	0,30
1924	9	4 325	91	45 650	100	49 975	0,50
1925	32	9 600	226	50 400	258	60 000	0,23
1926	126	37 800	210	42 000	336	79 800	0,24
1927	67	13 400	753	135 526	819	148 926	0,18
1928	130	16 410	316	65 000	446	81 410	0,18
1929	12	4 150	353	70 600	365	74 750	0,20

The large catch of sprats in the Limfjord in recent years indicates that the stock is very considerable. In addition there are large numbers of sprats in the North Sea near the west coast of Jutland which are practically untouched by fishing operations. It is quite clear that a Danish canning industry could be based on the sprat stock in these regions, but up to the present none has been developed. The majority

of the sprats caught in the Limfjord (c. 70 %) are sold to Germany, the remainder being disposed of to Sweden, Norway and Denmark.

Fig. 1. Districts A, B and C in the Limfjord.

Both in the case of herring and sprat the size of the annual catch is subjected to great fluctuations, but there is no rule that a good herring year implies a good sprat year or *vice-versa*. There are, it is true, many points of resemblance in the habits of the two species, but there are also great differences, such as for instance the fact that the herrings' eggs are deposited on the sea bottom, whereas the sprats' eggs float in the water, or that the life cycle of the herring extends over a far greater period than that of the sprat.

In the period 1919—1929 the yield of the herring fishery in the Limfjord was as follows (the figures are taken from the "Fiskeri-Beretning"):

1919	4 067 Tons	1925	4 165 Tons
1920	2 384 —	1926	1 730 —
1921	3 404 —	1927	1 942 —
1922	1 988 —	1928	1 901 —
1923	4 586 —	1929	986 —
1924	3 647 —		

It will be seen that whereas the largest yield of the sprat fishery falls within the period 1926—1929, the yield of the herring fishery was largest in the years 1919, 1921, and 1923—1925.

Fishing for sprats in the Limfjord takes place between the beginning of October and the end of May, the months November—February being the most important.

When the temperature of the water becomes low, the sprats collect in the deeper parts of the Fjord where the temperature is relatively high. They are then caught there with the seine. In spring, when the sprats gather in shoals for reproduction, quite considerable catches can be made with pound-nets.

Sprats are not fished during the months June—September in the Limfjord, but they have not left the Fjord. At fishing experiments with stramin trawl and

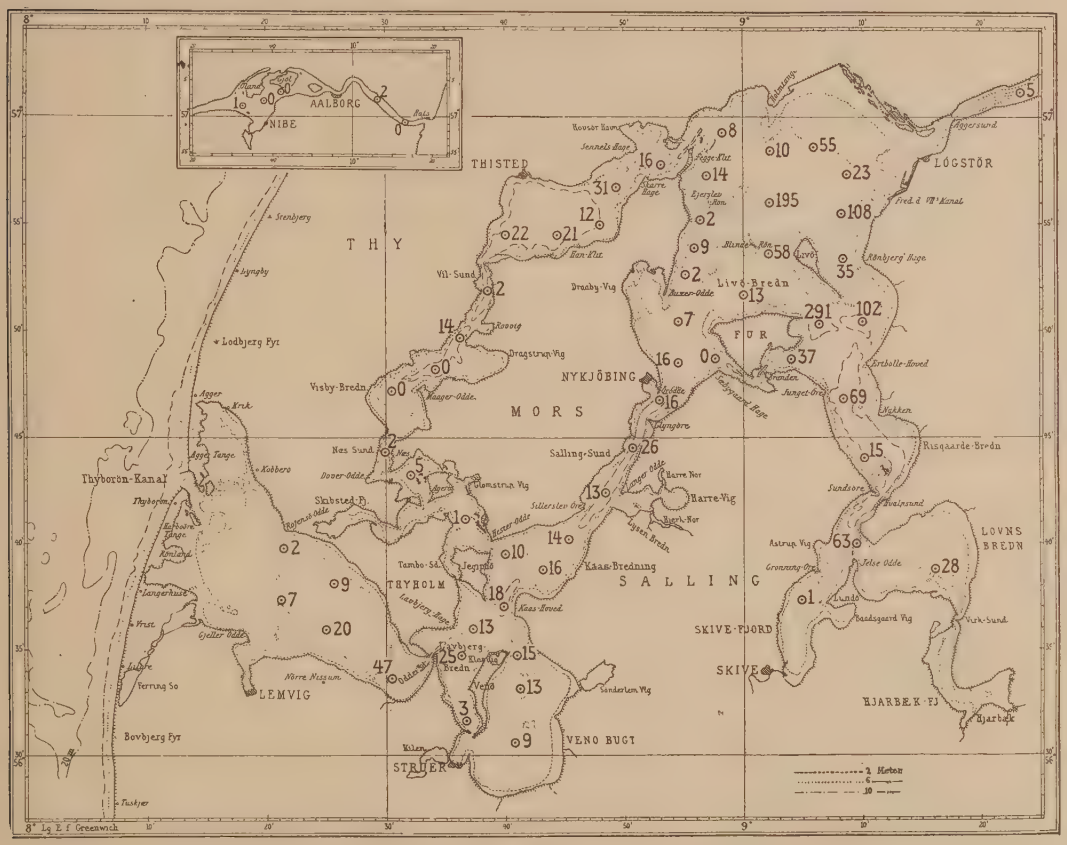


Fig. 2. Number of sprat eggs caught with Hensen Net per sq. metre of surface in the beginning of May 1930.

fine-meshed seines sprats of various ages and sizes are caught in the Limfjord also in these months.

The sprats caught in fishing operations in the Limfjord are as a rule between 7 and 13 cm. in length.

The spawning season of the sprat in the Limfjord extends from April till July.

Fig. 2 shows how many sprat eggs were taken in the different parts of the Limfjord per sq. metre of surface at the vertical fishing experiments with the large

Hensen net (opening 1 sq. metre) from the "Japetus Steenstrup" between the 1st and 6th of May 1930. It will be noticed that the eggs were distributed throughout all parts of the Fjord and that the bulk of them were found in the central and eastern part of Livø Broad. The average catches per sq. metre of surface in the different parts of the Fjord were as follows:

In	District	A	13 eggs	per sq. metre of surface
-	—	B	45 —	— —
-	—	C	1 egg	— —

By far the greatest number of eggs were taken in District B, where also the yield of the sprat fishery is greatest.

Most of the eggs taken in the Limfjord in the beginning of May 1930 were in the disc stage.

An analysis of 110 mature sprats caught in pound-nets in Hvalpsund on June 23th, 1930, showed the following distribution as to length and sex:

cm.	♂	♀
10,5	12	4
11	31	13
11,5	13	13
12	6	9
12,5	..	6
13	..	3
Total...	62	48
Mean length in cm....	11,1	11,6
Mean weight in grammes...	10,4	11,5

All the males and females were in the stage of maturity VI or VI—VII (ripe or nearly spent).

Growth and Age.

From the 1st until the 6th of May 1930 a number of sprat eggs were taken in the Limfjord with the large Hensen net but no sprat larvae. In a sample caught in the Limfjord W. of Fur with Petersen's stramin young fish trawl on September 4th 1930 the specimens were of the following lengths:

23 mm	1	specimen
25 -	1	—
26 -	1	—
27 -	4	—
28 -	9	—
29 -	10	—
30 -	18	—
31 -	5	—
34 -	1	—
Total...	50	specimens

These sprats undoubtedly belonged to the 0-Group, the average length of the individuals being 29 mm. The largest of these were silvery, and in the individuals 30—34 mm scale formation had commenced.

The circumstance that the sprats were caught with the stramin trawl might suggest that only the smaller individuals of the 0-Group were represented in the catch. Samples were in fact taken of larger individuals of the 0-Group at fishing experiments which had been carried out shortly before, with Danish eel seine.

On August 20th 1930 a sample of sprats of the following lengths were caught in the Limfjord N.E. of Ørodde with a fine-meshed Danish eel seine:

4,5 cm	1	specimen
5 -	7	—
5,5 -	22	—
6 -	17	—
6,5 -	5	—
7 -	2	—
7,5 -	2	
8 -	0	—
8,5 -	2	—
9 -	6	—
9,5 -	2	—
10 -	1	—
Total...	67	specimens

These individuals fall clearly into two size groups.

An investigation of the number of winter rings in the scales of a sample of these individuals gave the following result:

No. of winter rings	0	1	2
6,5 cm	2	..	..
7 -	2	.	.
7,5 -	1	..	..
8,5 -	..	2	..
9 -	..	5	..
9,5 -	..	..	2
10 -	..	..	1
	5	7	3

The scale investigation thus confirmed the theory that the smallest size group, viz. the individuals 4,5—7,5 cm. in length, belonged to the 0-Group.

In a sample of sprats, caught with the Danish eel seine on August 18th 1930 at the western entrance to Fur Sound, the lengths were as follows:

6,5 cm	3	specimens
7,5 -	7	—
8 -	32	—
8,5 -	80	—
9 -	77	—
9,5 -	43	—
10 -	27	—
10,5 -	13	—
11 -	11	—
11,5 -	5	—
12 -	6	—
Total...	304	specimens

A determination of the number of winter rings in the scales of a sample of these individuals gave the following result:

No. of winter rings	0	1	2	3	?
6,5 cm	1	..	..	..	..
7,5 -	1	1	..	..	..
8 -	1	5	..	..	2
8,5 -	..	6	..	..	4
9 -	..	6	..	..	3
9,5 -	..	7	1	..	4
10 -	..	..	1	..	3
10,5 -	..	2	2	..	2
11 -	..	..	3	..	1
11,5 -	..	..	1	2	2
12 -	..	1	..	..	1
Total...	3	28	8	2	22

If we assume that all the individuals in whose scales no trace of winter rings were to be found belonged to the 0-Group, the investigation shows that in the last half of August and the beginning of September the size of the individuals of the 0-Group in the Limfjord varied from about 2 to 8 cm. in length. Bjerkan found that in 1926 the size of the 0-Group of sprats varied in the same months off the southern coast of Norway from about 3 to 9 cm.[1]).

From the sample caught on August 18th 1930 in Fur Sound we can conclude that the I-Group at that date varied in size from about 7,5 to 10,5 cm., and that the mean length was about 9 cm.

[1]) Paul Bjerkan: Brislingeundersøgelserne 1926. Aarsberetning vedkommende Norges Fiskerier 1927.

In a sample of the ripe sprats, mentioned above, which were caught in Hvalpsund on June 23rd 1930, the following numbers of winter rings were observed:

No. of winter rings	1	2	?
10 cm.	1	2	1
11 -	3	4	3
12 -	..	3	3
Total...	4	9	7

In a sample of sprats caught with purse seine in Sallingsund on January 19th 1916, the following numbers of winter rings were observed:

No. of winter rings	0	1	2	?
8 cm.	1	..	..	..
9 -	2	..	..	1
9,5 -	2	..	..	..
10 -	1	2	..	2
10,5 -	1	2	..	..
11 -	1	2	1	3
11,5 -	..	2	2	..
12 -	..	1	1	..
Total...	8	9	4	6

It is a striking fact that among some of the above-mentioned individuals of 7,5—8 cm. in length caught in August, and among some of the individuals, 10—11 cm.

Fig. 3. Scale of sprat, 11 cm. in length. Sallingsund, Jan. 19th, 1916, No. distinct "winter ring". Two or three rings may be observed which are taken here as "secondary".

in length caught in January, there were still no traces of winter rings. It seems probable that not all the individuals of the 0-Group in the Limfjord get their scales before winter sets in. In places where the sprat's spawning season extends still later into the year than July there are probably many individuals which do not get their scales before winter sets in, and in such places the age determinations by means of the zones in the scales are very unreliable. Moreover in many cases, it seems impossible to distinguish between "secondary rings" and "winter rings" in the scales of sprats.

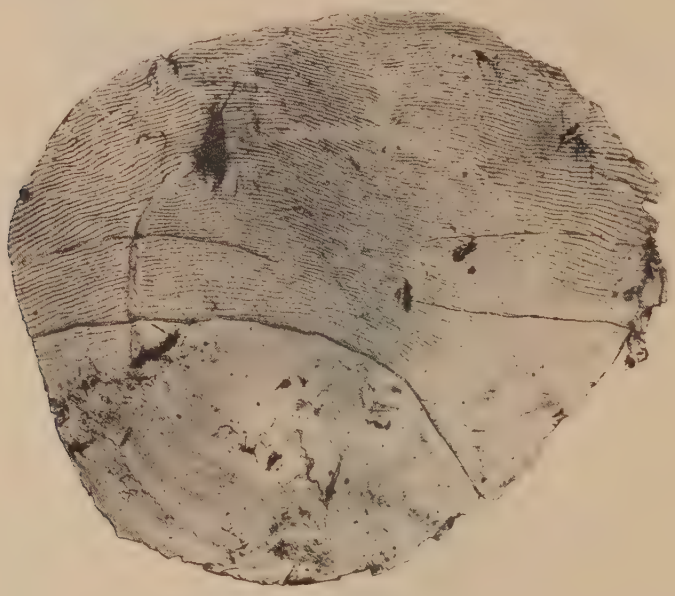


Fig. 4. Scale of sprat, 12 cm. in length. Sallingsund, Jan. 19th, 1916. One winter ring. A less distinct ring not far from the edge of the scale is visible. It is regarded here as "secondary".

Racial characters.

The total numbers of vertebrae in the above-mentioned sample of ripe sprats caught on June 23rd 1930 in Hvalpsund were as follows:

Vert. S.	♂	♀	♂+♀
45	..	1	1
46	17	10	27
47	33	27	60
48	10	10	20
49	2		2
No. of individuals...	62	48	110
m	46,95	46,96	46,95
σ	0,76	0,71	0,73
σ_m	0,10	0,10	0,07

The total numbers of vertebrae in a sample of sprats, 8—12 cm. in length, caught in Fur Sound on August 18th 1930 were as follows:

Vert. S.	Individuals
45	1
46	7
47	26
48	10
No. of individuals	44
m	47,02
σ	0,70
σ_m	0,11

The countings for both samples have been carried out by Mr. S. W. Fogh.

For the sake of comparison with the mean numbers arrived at, Paul Bjerkan's figures[1]) for the mean numbers among sprats from various localities in the North Sea and off the Skagerak coasts of Norway and Sweden are given below:

Locality	Mean No. of Vertebrae	No. of Individuals examined
Ostende	47,714	77
Lowestoft	47,625	80
St. Andrews Bay	47,934	76
Drönen, Norw. West Coast	47,95	66
Bomlö, Norw. West Coast, Year-class 1928	48,696	102
Oslo Fjord, Year-class 1927	48,00	100
Sandnes Fjord, Year-class 1928	48,728	841
Oslo Fjord, Year-class 1929	48,06	198
Gulmar Fjord	47,77	100
Gulmar Fjord	47,68	100

The above Table shows that the sprats from the Limfjord have an appreciable lower number of vertebrae than the samples which have been examined from the North Sea and the coasts of Norway and Sweden bordering on the Skagerak. Presumably the sprats which spawn in the Limfjord are a special Fjord race.

[1]) Paul Bjerkan: Brislingeundersøgelser, Aarsberetning vedkommende Norges Fiskerier 1928. Bergen 1929.

Idem: On the Validity of the "Race Characters" of the Food-Fishes. Rapports et Procès-Verbaux. Cons. perm. internat. Vol. LIV. Copenhague, Mars 1929.

Idem: in Rapports et Procès-Verbaux vol. LX 1929, p. 130 and vol. LXVI 1930, p. 149.

III.

On the Influence of hydrographical Factors upon the Yield of the Mackerel Fishery in the Sound.

By

AAGE J. C. JENSEN

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1. Statistical data as to the Danish mackerel fishery in the Sound.

The mackerel fishery in the Sound is a pronouncedly seasonal fishery which takes place chiefly in August, September, and October, culminating in September. The fishermen use chiefly pound-nets.

In the Fiskeri-Beretning are given both the monthly catches landed at Copenhagen and the annual yield landed in the two areas 1) the shores of "the Sound" from Gilbjærghoved—Kullen to Dragør—Limhamn, and 2) the shores of "the Baltic (eastern area)", S. of Dragør—Limhamn and E. of Gjedser—Darsserort. The latter area is practically identical with the east coast of Sealand, as the catches off Møen and Falster are relatively small. The catches off Bornholm were not recorded at all prior to 1919 and did not amount to more than 370 kilograms a year at most from 1919 till 1924 when they were recorded in the Fiskeri-Beretning.

The catches landed at Copenhagen were taken for the most part in pound-nets in the northern part of Køge Bay. In the figures for the annual catch they are in the later years included in the catches taken in the Sound, formerly essentially in the catches in the Sound.

In Table 1 below is shown the monthly catch of mackerel in the Sound landed at Copenhagen by Danish fishermen for the period commencing in 1912, during which the catches are recorded in the fishery statistics. The Table gives moreover the yearly catches landed on the shores of the Sound, N. of Dragør—Limhamn, and in the adjacent area to the south of this, i.e. that which figures in the Fiskeri-Beretning as "the Baltic (eastern area)".

It must be mentioned here that the catches are given in scores in the Fiskeri-Beretning up till and including 1915 and have been converted to kilograms in this Table, one score being taken as equivalent to 8 kg.[1]). Owing to the considerable variations which take place from one year to another in the average weight per score of the mackerel the quantities here arrived at are only to a slight degree comparable with the quantities after the year 1915.

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[1]) See A. C. Johansen and E. Neergaard-Møller: Biologisk-statistiske Oplysninger om det danske Saltvandsfiskeri i 1909. — Medd. f. Komm. f. Havunders., Ser. Fiskeristatistik. Bd. 1. 1912, p. 87.

Table 1. The catches in tons af mackerel in the Sound and the adjoining parts of the Baltic[1]).

	Landed at Copenhagen from the Sound[2])								The Sound N. of Dragør—Limhamn	South of Dragør—Limhamn[3])
	May	June	July	Aug.	Sept.	Oct.	Nov.	Year	Year	Year
1912	—	6.6	0.06	20.8	125.2	2.5	—	155	203	280
1913	—	2.7	0.4	12.2	25.6	12.1	—	53	44	30
1914	—	—	0.8	23.6	95.7	26.2	1.4	148	125	31
1915	—	0.5	31.4	42.0	254.4	37.9	—	366	338	191
1916	—	0.2	1.7	15.4	45.0	9.6	0.1	72	66	66
1917	—	0.03	2.7	18.2	21.4	5.3	—	47	41	13
1918	—	12.9	30.0	17.1	82.8	14.7	1.2	159	139	36
1919	—	0.05	1.1	28.1	89.8	30.6	0.01	150	160	25
1920	—	0.4	2.4	10.5	34.7	6.7	—	55	86	13
1921	0.3	0.2	1.2	33.7	46.9	17.2	1.1	101	235	86
1922	—	—	6.5	38.2	150.0	119.7	—	314	336	36
1923	—	—	0.9	26.1	132.3	8.5	0.04	158	223	69
1924	—	0.1	—	6.0	39.9	22.2	—	68	157	72
1925	—	3.5	—	33.4	104.3	8.0	—	149	189	67
1926	—	0.2	1.8	12.7	170.2	23.8	—	209	287	82
1927	—	0.2	—	4.2	43.0	8.4	0.01	56	110	89
1928	—	—	—	19.4	63.8	34.3	0.6	118	169	70
1929	—	0.5	7.1	23.0	23.6	13.4	0.4	68	190	30

In an investigation such as this into the causes of the fluctuations in the yield of the mackerel fishery the figures expressing the weight have a quite other significance than the figures expressing the numbers, since the number of mackerel depends to a great extent on the issue of the different spawning years, whereas the weight is influenced by this to a much smaller extent. The total stock of mackerel spawned in a certain year have approximately the same weight for several consecutive years, since the weight per score increases from one year to another whilst the number of mackerel spawned in the year in question decreases. In giving the catches in terms of weight the effect of the more favourable or less favourable spawning years is to some extent eliminated. The weight of the total stock of mackerel will be more uniform from year to year than the number of mackerel.

It will be seen from the Table that the fluctuations in the yield of the mackerel fishery from year to year have been very great in these regions. In those years subsequent to 1912 when the yield was least it was 8 times less than in the years which gave the greatest yield.

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[1]) The figures for the catches in 1929 were kindly furnished by Mr. A. Strubberg, cand. mag., of the fishery directorate.

[2]) In addition 45 kg. of mackerel were landed in April 1920.

[3]) The Area which figures in the Fiskeri-Beretning as "The Baltic (eastern area)".

How the fluctuations in the catches for the different months from year to year stand in relation to each other and to the total catch can be investigated by calculating the correlation coefficients between the different columns giving the catches[1]).

In Table 2 the catches in September, i.e. in the month when the greatest monthly quantities are caught, are compared with the catches in the other months.

Table 2. The catches of mackerel landed at Copenhagen from the Sound in September, correlated with the catches from the Sound in June, July, August, and October.

Month	Calculated for 1912—29		Calculated for 1916—29	
	r	σ_r	r	σ_r
June	0.04	0.24	0.05	0.27
July	0.49	0.18	0.05	0.27
August	0.50	0.18	0.30	0.24
October	0.41	0.20	0.50	0.20

It will be seen that in every case there seems to be a positive correlation, but that we cannot from the catches during the period from which we possess data as to the size of the catch with any certainty reckon with such a connexion between the catch in September and in the other months. The correlation coefficient (r) is namely in every case less than three times the probable error (σ_r) of r.

From Table 3 in which the catch in August is compared with the catches in June, July, and October, and the catch in July with the catches in June and October it will be seen moreover that we can with great certainty reckon with a connexion between the catches in June and July in the period in question, but that this is not the case as regards the catches in the other months.

Table 3. The catches of mackerel landed at Copenhagen from the Sound in July and August correlated with the catches in other months.

Catch in July correlated with catch in	Calculated for 1912—29		Calculated for 1916—29	
	r	σ_r	r	σ_r
June	0.51	0.17	0.90	0.05
August	0.34	0.21	0.07	0.27
October	0.17	0.23	0.07	0.27
Catch in August correlated with catch in				
June	0.07	0.23	—0.02	0.27
October	0.41	0.20	0.38	0.23

[1]) Pearson's formula: $r = \frac{\Sigma p \alpha_x \alpha_y}{\sqrt{\Sigma p' \alpha_x^2 \cdot \Sigma p'' \alpha_y^2}} = \frac{\Sigma ab - \frac{\Sigma a \cdot \Sigma b}{n}}{\sqrt{\left(\Sigma a^2 - \frac{(\Sigma a)^2}{n}\right)\left(\Sigma b^2 - \frac{(\Sigma b)^2}{n}\right)}}$ is used.

The above calculations show that with a high degree of certainty we can estimate the prospects for the catch in July from the size of the catch in June, but that, for all other months, from the size of the catch of mackerel landed in Copenhagen in one month we can only to a slight extent draw any conclusions as to the size of the catch in the following months.

If we correlate the total annual yield from the Sound N. of Dragør—Limhamn with the monthly catch landed at Copenhagen from the Sound, we find, as is shown by Table 4, that the total yield is determined chiefly by the yield in September, but that the August and October catches are also of importance. The catches in June and July stand in no relation to the total yield.

Table 4. Total catches of mackerel in the Sound N. of Dragør—Limhamn correlated with the catches landed at Copenhagen from the Sound in June—October.

	1912—1929		1916—1929	
	r	σ_r	r	σ_r
June	—0.07	0.23	—0.10	0.26
July	0.32	0.21	—0.03	0.27
August	0.66	0.13	0.55	0.19
September	0.84	0.07	0.87	0.06
October	0.57	0.16	0.65	0.15

The total annual yield of mackerel S. of Dragør—Limhamn shows no certain dependable relation with the monthly catches of mackerel landed at Copenhagen nor with the total yield of mackerel from the Sound N. of Dragør—Limhamn. A calculation of the correlation coefficient for the latter relation gives $r = 0.35$; $\sigma_r = 0.21$ for the period 1912—1929, and $r = 0.31$; $\sigma_r = 0.24$ for the period 1916—1929.

2. Proof of a connexion between the monthly yield of the mackerel fishery and the temperature of the surface water.

The variations in the hydrographical conditions in the Sound from year to year are very great and it is therefore of interest to compare them with the variations in the yield of the mackerel fishery, since one would naturally assume that there is a possibility of a direct or indirect causal connexion.

As the mackerel at the time when they are caught in the Sound are usually to be found near the surface, we will compare the yield with the temperature and salinity of the surface.

By calculating the correlation between the average temperature at Drogden Lightship in the different months with the catch of mackerel landed at Copenhagen

from the Sound (i.e. from the northern part of Køge Bay, see p. 71) in the same month we obtain the coefficients shown in Table 5.

Table 5. The monthly catches of the mackerel fishery landed at Copenhagen from the Sound, correlated with the mean temperature of the surface water at Drogden in the same month.

	Calculated for 1912—29		Calculated for 1916—29	
	r	σ_r	r	σ_r
June	—0.07	0.24	0.41	0.22
July	—0.18	0.23	—0.22	0.25
August	—0.39	0.20	—0.49	0.20
September	—0.47	0.18	—0.85	0.07
October	—0.49	0.18	—0.62	0.16

In the Table the correlation coefficients are calculated both for the period 1912—29 and for the period 1916—29, so that in the latter calculations are excluded the years 1912—15, the catches taken in which can only be considered comparable to a slight degree with those of the later years (cp. p. 72).

It will be seen that between the monthly catches in September and October and the temperature of the surface water in the same month there is a relation established with great certainty, since the correlation coefficient calculated for the period 1916—29 is in these two months 8 and 4 times larger respectively than its mean error σ_r, and that there is possibly also a relation as regards August, since the correlation coefficient is about $2^1/_2$ times as large as σ_r. In years when the temperature of the surface water is low in late summer and autumn the yield of the mackerel fishery in the northern part of Køge Bay is greater than normal, the reverse being the case when the temperature of the surface water is high.

In Table 6 the monthly catches are correlated with the mean salinity in the same month. This shows that there is no demonstrable relation between the salinity of the surface water and the catches of mackerel in the same month.

Table 6. The monthly mean salinity of the surface water at Drogden correlated with the catches of mackerel landed at Copenhagen from the Sound in the same month.

	Calculated for 1912—29		Calculated for 1916—29	
	r	σ_r	r	σ_r
June	0.05	0.24	0.09	0.27
July	0.07	0.23	—0.29	0.25
August	0.32	0.21	0.33	0.24
September	—0.06	0.23	—0.16	0.23
October	—0.42	0.19	—0.30	0.24

As is seen from Table 1, September gives a yield which is on an average four times as large as that of August or October. The September catch is therefore undoubtedly more representative of the size of the stock than the catches in the other months, and it will consequently be chiefly used in the following investigations.

Table 1 shows that the catch in September has on the whole been on the increase from year to year since 1916. We cannot, as mentioned above, compare the catches in the years prior to 1916 with the catches after that date since when they have been recorded in the statistics in terms of weight.

This rise has been due to the increased intensity of fishing. Year after year the number of pound-nets became greater and they were placed farther out in steadily increasing depths. In order better to express the catch in relation to the intensity of fishing we can measure the anomalies from the normal catch in each year by using a rising normal curve instead of, as has been done in the above calculation, one and the same normal catch, i.e. the average catch. Unfortunately, however, it is impossible to produce any completely objective standard for the normal catch per fishing unit. In order to exclude a subjective estimate as far as

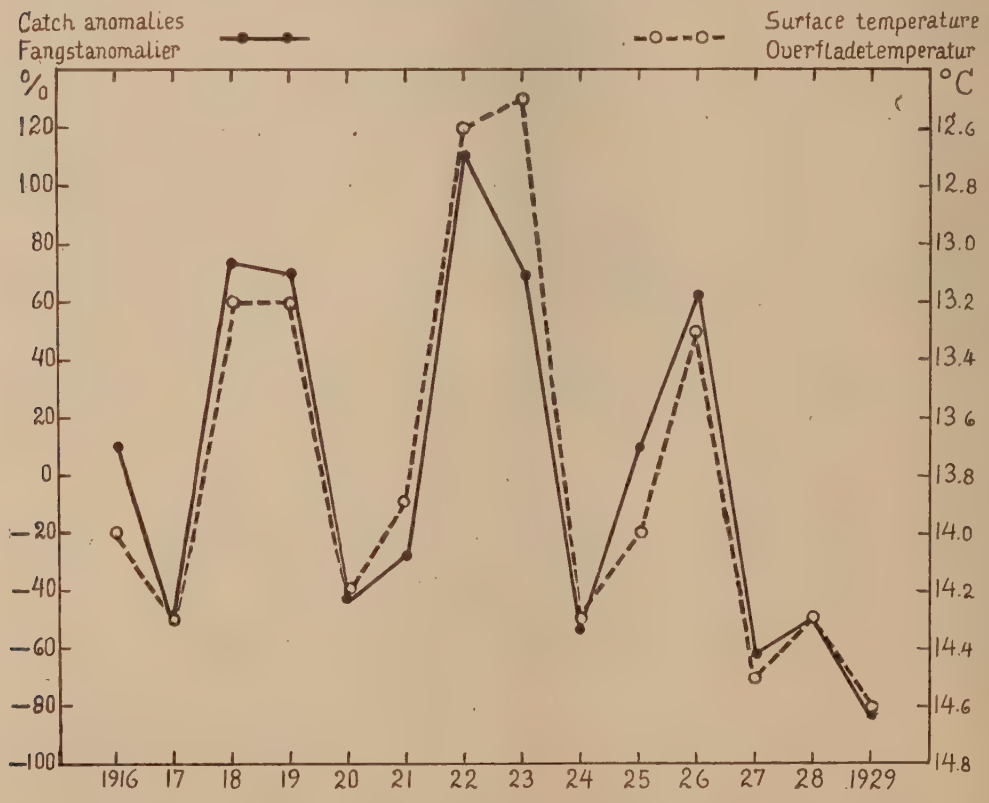

Fig. 1. Percentage anomalies from normal catch of mackerel in September landed at Copenhagen from the Sound compared with the mean temperature of the surface water at Drogden Lightship in the same month.

possible, the normal curve may be plotted with a rise of a uniform percentage from year to year. Even if this scarcely corresponds entirely to the facts it is certain that on an average considerably more accurate values for the normal catch will be obtained than by using the average catch for the period as the normal catch.

If we put the normal catch in 1916 as 40 tons and a yearly percentage rise as 10 % per annum, the actual catch will appear fairly even distributed under and above the normal curve.

By now correlating the percentage anomalies from normal of the September catch with the surface temperature at Drogden in September we obtain:

$$r = -0.95;\ \sigma_r = 0.03.$$

This relation is shown in Fig. 1.

3. The causes of the connexion established between the surface temperature and the catches of mackerel.

If we consider the size of the correlation established, we see that it is most probable that the relation between catch and temperature is due to the fact that the size of the mackerel stock depends directly on the temperature, but yet there is a possibility that it may depend on a factor which is closely determined by the surface temperature or a factor which closely determines both the size of the mackerel stock and the surface temperature.

We will therefore investigate which factors determine the temperature of the surface water in the months in question, and then proceed to investigate whether these factors show the same fluctuations from year to year as the mackerel fishery.

Such an investigation will be particularly interesting inasmuch as it will show whether it is possible to forecast the yield of the mackerel fishery.

A. The dependence of the surface temperature on various factors.

The temperature of the surface water may be determined by the following factors, 1) the temperature of the atmosphere, 2) the amount of radiant heat from the sun, and 3) the temperature of the water during the preceding period.

Where the water which for instance is at Drogden in September was to be found in the preceding months depends on the currents. As a rule there is a north-going current at Drogden, but at times the current flows southwards[1]). Unfortunately observations of the temperature of the water coming from the Baltic have been made throughout a long period only at Christiansø, and here only with reference

[1]) See Martin Knudsen: Havets Naturlære. — Skrifter udgivne af Komm. f. Havunders. No. 2. 1905, and J. P. Jacobsen: Die Wasserumsetzung durch den Øresund, den grossen und den kleinen Belt. Medd. f. Komm. f. Havunders. Ser. Hydrografi. Bd. II. No. 9. 1925.

to the surface water. Observations of the water coming from the north are carried out at Lappegrund Lightship.

The water which coming from the north passes over the ridge at Drogden forms together with the water which through the Gedser-Darss straits enters the true Baltic a bottom layer in the latter, which gradually mingles with the surface water and plays a part in determining the temperature of the water which passes out at Drogden. The surface temperature at Drogden is therefore also determined by the temperature of the water at Drogden during the preceding period.

Besides the temperature of the water at the various localities, a correlation with the salinity of the water is of interest since this gives us information as to the currents and the mixtures between the water layers which determine the temperature.

The temperature of the air. By correlating the surface temperature at Drogden in September with the temperature of the air in the same and the preceding months we obtain the following coefficients.

Table 7. The surface temperature at Drogden in August and September correlated with the temperature of the air at Copenhagen in the same and the preceding months (1912—29).

Air temperature	Surface temperature			
	in August		in September	
	r	σ_r	r	σ_r
2 months previously	0.44	0.19	0.32	0.21
1 month previously	0.72	0.11	0.55	0.16
the same month	0.94	0.03	0.58	0.16

It will be seen that in August the temperature of the surface water and the temperature of the air undergo approximately the same fluctuations from year to year, and that the temperature of the surface water in August also shows in a high degree the same fluctuations from year to year as the temperature of the air in July.

Also in September the temperature of the surface water undergoes largely the same variations from year to year as the temperature of the air in the same and the preceding month.

Amount of cloud. If we correlate the temperature of the surface water at Drogden in September with the amount of cloud at Copenhagen in the same and the preceding months we in no case, as appears from Table 8, obtain any real correlation.

The number of hours of sunshine which is inversely proportional to the amount of cloud over the Baltic in the preceding months, on the other hand, seems to be of some importance as a determining factor for the temperature of the surface water

in September. There is, however, a possibility that the correlation is partially due to the fact that both the amount of cloud and the temperature of the surface water are determined by, amongst other things, one and the same third factor, i.e. the wind.

Table 8. The surface temperature at Drogden in September correlated with the amount of cloud at Copenhagen and Hammershus in July, August, and September (calculated for the period 1912—29).

	Amount of Cloud at Copenhagen		Amount of Cloud at Hammershus	
	r	σ_r	r	σ_r
July	—0.11	0.23	—0.51	0.17
August	—0.08	0.23	—0.20	0.23
September	—0.38	0.20	—0.13	0.23

The wind. One of the factors which in the highest degree determines what water is to be found at Drogden is the wind. It has been shown from the investigations undertaken by Dr. Jacobsen that the direction of the wind which, disregarding its frequency and strength, has the greatest influence on the current at Drogden, is from the west[1]). As the west wind moreover is the most frequent, having blown in the years in question in July, August, and September for 24, 29, and 24% respectively of the month, and as a rule the strongest, its influence on the current at Drogden is far greater than that of winds from any other quarter. We will therefore confine ourselves to investigating the influence of the west wind on the temperature of the surface water.

Table 9. The surface temperature at Drogden in August and September correlated with the frequency of the west wind in the same and the preceding months (calculating for 1912—29).

Frequency of west wind	Surface temperature in			
	August		September	
	r	σ_r	r	σ_r
2 months previously	—0.53	0.17	—0.19	0.23
1 month previously	—0.71	0.12	—0.56	0.16
the same month	—0.59	0.15	—0.35	0.21

We see that there is a demonstrable correlation between the frequency of the west winds and the surface temperatures during the period 1912—29, both as regards the temperatures for August and September.

As the wind also exerts a very great influence on the temperature of the air there is an antecedent possibility that a considerable part of the correlation between

[1]) J. P. Jacobsen: Beitrag zur Hydrographie der dänischen Gewässer. — Medd. f. Komm. f. Havunders. Ser. Hydrografi. Bd. II. Nr. 2. 1913.

the temperature of the surface water and the temperature of the air is due to the simultaneous effect of the wind on these two factors.

For the period 1912—29 the correlation coefficient between the frequency of the west wind in August and the temperature of the air in the same month is thus $r = -0.67$; $\sigma_r = 0.13$.

The temperature and salinity of the water. From the Table below in which the surface temperature at Drogden in September is correlated with the surface temperature and salinity in the preceding months we see that in no case can an at all reliable correlation be established. There is, as appears from calculations of the correlation coefficient for longer periods than that here in question, a reliable positive correlation between the surface temperature in September and the surface temperature in the immediately preceding months, but the correlation figure is so small that it has only very little value for a prognosis.

Table 10. The surface temperature at Drogden in September correlated with the surface temperature and salinity in the preceding months (1912—29).

	Temperature		Salinity	
	r	σ_r	r	σ_r
May	0.05	0.24	—0.30	0.21
June	0.10	0.23	—0.12	0.23
July	0.35	0.21	0.02	0.24
August	0.46	0.19	—0.30	0.21

By correlating the surface temperature in September with the temperature and salinity at Drogden, at the bottom, we obtain the correlation coefficients given in Table 11.

Table 11. The surface temperature at Drogden in September correlated with the temperature and salinity at the bottom in the same and the preceding months (1912—29).

	Temperature		Salinity	
	r	σ_r	r	σ_r
July	0.46	0.19	—0.17	0.23
August	0.56	0.16	—0.33	0.21
September	0.96	0.02	—0.02	0.24

It will be seen that between the surface temperature at Drogden in September and the bottom temperature at the same place in the same and the preceding month there is a plainly demonstrable relation, and that such a relation also seems to exist between the surface temperature in September and the bottom temperature

in July. On the other hand no relation can be found between the surface temperature in September and the salinity at the bottom in the same and the preceding months.

If we correlate the surface temperature at Drogden in August with the temperature at Drogden at the bottom in July, we obtain: $r = 0.09$; $\sigma_r = 0.23$ (1912—29), and the corresponding calculation of the correlation between the surface temperature in October and the bottom temperature in September give: $r = -0.27$; $\sigma_r = 0.22$ (1912—29), i. e. no demonstrable correlation.

If we finally correlate the surface temperature at Drogden in September with the temperature and salinity at Christiansø (surface), we find (see Table 12), that the correlation coefficients, except as regards the September and August temperatures at Christiansø, are far less than 3 times σ_r. From Table 12, in which the surface temperature at Drogden in September is moreover correlated with the bottom temperature and salinity at Lappegrund, we see further that the surface temperature at Drogden in September seems to some extent to be determined by the salinity in the lower water layers in the northern part of the Sound during the immediately preceding period, i.e. by the strength of the inflowing (south-going) current in the lower water layers.

Table 12. The surface temperature at Drogden in September correlated with the temperature and salinity at Christiansø (0 m.) and at Lappegrund (bottom) in July—September (1912—29).

	Christiansø, 0 m.				Lappegrund, bottom			
	Temperature		Salinity		Temperature		Salinity	
	r	σ_r	r	σ_r	r	σ_r	r	σ_r
July	0.24	0.22	0.09	0.23	—0.11	0.23	0.40	0.20
August	0.49	0.18	0.02	0.24	—0.33	0.21	0.48	0.18
September ...	0.64	0.14	0.07	0.23	—0.33	0.21	0.42	0.19

B. The fluctuations in the yield of the mackerel fishery correlated with the variations in the hydrographical and meteorological factors which influence the surface temperature.

We will here examine the various meteorological and hydrographical factors in the same order as above, correlated firstly with the catch in September, secondly with the catch in August and October, and thirdly with the total catch.

a) The September catch.

The temperature of the air and the wind conditions compared with the September catch. The catch of mackerel landed at Copenhagen in September shows the following correlation with the temperature of the air at Copenhagen and with the frequency of the west wind in the same and the preceding months.

It will be seen firstly that only in September does the temperature of the air show a considerable correlation with the catch in September and secondly that

only the frequency of the west wind in August shows a connexion with the catch. The first statement accords fully with what was found to be the case as regards the correlations between the surface temperature of the water in September and the temperature of the air, the latter connexion being to some extent, as mentioned on p. 79, not a direct causal connexion but a simultaneous effect of a third factor (the wind). The second statement accords with what was found as regards the correlations between the surface temperature in September and the frequency of the west wind.

Table 13. The catch of mackerel landed at Copenhagen from the Sound in September correlated with the temperature of the air in July—September.

	Temperature of the air				Frequency of the west wind			
	1912—29		1916—29		1912—29		1916—29	
	r	σ_r	r	σ_r	r	σ_r	r	σ_r
July	0.04	0.24	0.07	0.27	—0.21	0.23	—0.13	0.26
August	—0.24	0.22	—0.34	0.24	0.48	0.18	0.60	0.17
September ...	—0.43	0.19	—0.54	0.19	0.04	0.24	0.21	0.26

The influence of the west wind on the fishery yield seems to be exerted indirectly through its effect on the temperature of the water. The correlation between the frequency of the wind and the surface temperature of the water is shown in Table 9, and by calculating the correlation between the bottom temperature in August, which showed a distinct connexion with the surface temperature in September, and the frequency of the west wind in August we obtain: $r = -0.53$; $\sigma_r = 0.17$ (1912—29).

The amount of cloud (number of hours of sunshine) compared with the catch in September. As pointed out on p. 78 and Table 8, there is a demonstrable relation only between the surface temperature in September and the amount of cloud at Hammershus in the preceding months.

As E. I. Allen proved in 1910, the yield of the mackerel fishery in the English Channel in May shows a very pronounced dependence on the number of hours of bright sunshine in the preceding months, but on the other hand no dependence on the temperature of the water. The dependence on sunshine in the preceding period is to be explained by the latter's stimulating effect on planktonic production[1]).

In order to investigate whether the same holds good in the Sound in the autumn months, the amount of cloud, which is inversely proportional to the number of hours of sunshine, is correlated with the catch in September in Table 14.

It will be seen that there is an indication of positive correlation between the catch in September and the amount of cloud at Copenhagen in the same month, and between the catch and the amount of cloud at Hammershus in the preceding

[1]) E. I. Allen: Mackerel and Sunshine. — Journal Marine Biol. Association. Vol. VIII 4. 1910.

months, corresponding with the negative correlation established between the amount of cloud and the surface temperature in September (Table 8), but that on the other hand there is no indication of the size of the catch being in any other way in relation with the amount of cloud (or hours of sunshine).

Table 14. The catch of mackerel landed at Copenhagen from the Sound correlated with the amount of cloud at Copenhagen and Hammershus in the same and the preceding months.

	Amount of cloud at Copenhagen				Amount of cloud at Hammershus			
	1912—29		1916—29		1912—29		1916—29	
	r	σ_r	r	σ_r	r	σ_r	r	σ_r
May	0.09	0.23	0.12	0.26	0.07	0.23	0.17	0.26
June	—0.22	0.22	—0.09	0.27	0.06	0.23	0.32	0.24
July	0.06	0.23	—0.10	0.26	0.28	0.22	0.28	0.25
August	0.26	0.22	—0.36	0.23	0.38	0.20	0.38	0.23
September	0.08	0.23	0.41	0.22	—0.12	0.23	—0.08	0.27

The temperature and salinity of the water compared with the catch in September. If we correlate the catch in September with the surface temperature and salinity at Drogden in the months May—August, we obtain for the period 1916—29 in each case a correlation coefficient which is less than twice σ_r (for the period 1912—29 in each case there is a correlation which is less than $2^1/_2$ times σ_r).

If on the other hand we correlate the catch in September with the bottom temperature and salinity in the preceding months we obtain the values shown in Table 15.

Table 15. The catch of mackerel landed at Copenhagen from the Sound in September correlated with the bottom temperature and salinity at Drogden, during the months May—September.

	Temperature				Salinity			
	1912—29		1916—29		1912—29		1916—29	
	r	σ_r	r	σ_r	r	σ_r	r	σ_r
May	0.14	0.23	0.28	0.25	0.31	0.21	0.43	0.22
June	—0.06	0.23	—0.16	0.26	0.07	0.23	0.07	0.27
July	—0.08	0.23	—0.52	0.19	0.41	0.20	0.32	0.24
August	—0.30	0.21	—0.61	0.17	0.28	0.22	0.27	0.25
September	—0.43	0.19	—0.64	0.16	—0.15	0.23	—0.18	0.26

Here there is, in accordance with the fact that the temperature of the bottom water in August showed a distinct correlation with the surface temperature in September, a genuine demonstrable correlation between the temperature of the bottom water in August and the catch in September.

In Fig. 2 the two factors, the frequency of the west wind and the bottom temperature which each showed a reliable correlation (r greater than 3 times σ_r) with the surface temperature in September and the catch of mackerel in this month, are shown together with the surface temperature and the catch. The Figure also shows the temperature of the air at Copenhagen in August.

A calculation of the correlation between the catch in September and the temperature and salinity at Christiansø, 0 m., and at Lappegrund, at the bottom, in May—August shows, as was to be expected from the calculations shown in Table 12, in no case a reliable correlation coefficient.

b) The catches in August and October.

From Tables 7 and 9 we see that the surface temperature in August shows a reliable correlation with the temperature of the air and the frequency of the west wind in the same and the preceding months. Of these factors the temperature of the air, like the surface temperature, is partly determined by the wind (see p. 79).

As the correlation between the surface temperature in August and the catch in August was, however, fairly small, we cannot expect here any very pronounced connexion between the catch in August and the meteorological conditions in the preceding months. If we calculate the correlation coefficients between the yield of the mackerel fishery in August and the temperature of the air and the frequency of the west wind in the same and the preceding months (see Table 16), we find in fact that it is only with the frequency of the west wind in August that the catch in this month shows a reliable relation.

Table 16. The catch of mackerel landed at Copenhagen from the Sound in August correlated with the temperature of the air and the frequency of the west wind at Copenhagen in June, July, and August.

	Temperature of the air				Frequency of the west wind			
	1912—29		1916—29		1912—29		1916—29	
	r	σ_r	r	σ_r	r	σ_r	r	σ_r
June	0.21	0.23	0.18	0.26	0.02	0.24	0.13	0.26
July.....	—0.14	0.23	—0.15	0.26	0.16	0.23	0.28	0.25
August ..	—0.30	0.21	—0.44	0.22	0.62	0.15	0.66	0.15

Similarly the temperature and salinity at Drogden, Lappegrund, and Christiansø in the months May, June, and July show no reliable relation with the yield of the mackerel fishery in August.

The yield of the mackerel fishery in October shows no reliable connexion with any of the meteorological or hydrographical factors, here discussed, in the immediately preceding months.

c) The total catch landed on the shores of the Sound, N. of Dragør—Limhamn, is determined to a very large extent, as appears from Table 4, by the size

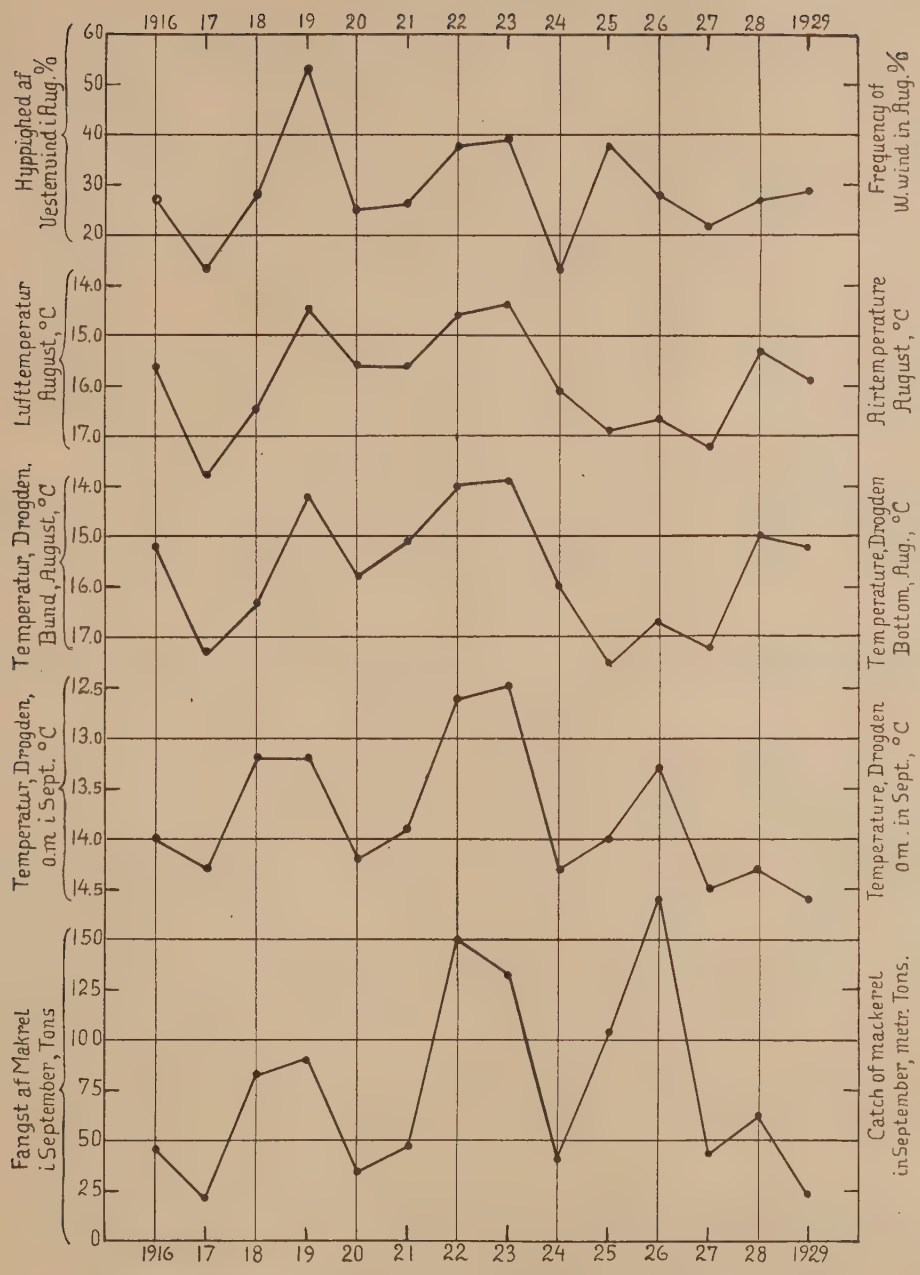
1916 17 18 19 20 21 22 23 24 25 26 27 28 1929
Hyppighed af Vestenvind i Aug. %
60 50 40 30 20
Frequency of W. wind in Aug. %
Lufttemperatur August, °C
14.0 15.0 16.0 17.0
Airtemperature August, °C
Temperatur, Drogden, Bund, August, °C
14.0 15.0 16.0 17.0
Temperature, Drogden Bottom, Aug., °C
Temperatur, Drogden, 0 m i Sept. °C
12.5 13.0 13.5 14.0 14.5
Temperature, Drogden 0 m. in Sept., °C
Fangst af Makrel i September, Tons
150 125 100 75 50 25 0
Catch of mackerel in September, metr. Tons.
1916 17 18 19 20 21 22 23 24 25 26 27 28 1929

Table 2. Catch of mackerel landed at Copenhagen from the Sound compared with the surface temperature at Drogden in the same month, bottom temperature at Drogden in August, and frequency of the west wind in the same month, and with the temperature of the air at Copenhagen in August.

of the catch in September. It is thus to a considerable extent the same factors which determine the size and total yield of the September catch.

If we correlate the total catch with the frequency of the west wind and with the bottom temperature at Drogden, we obtain the following correlation coefficients.

Table 17. The total yield of the mackerel fishery correlated with the frequency of the west wind and the bottom temperature at Drogden in July, August, and September.

	Frequency of west wind				Bottom temperature at Drogden			
	1912—29		1916—29		1912—29		1916—29	
	r	σ_r	r	σ_r	r	σ_r	r	σ_r
July	0.02	0.24	0.07	0.27	—0.30	0.21	—0.52	0.20
August	0.46	0.19	0.44	0.21	—0.49	0.18	—0.64	0.16
September .	0.15	0.23	0.15	0.26	—0.48	0.18	—0.41	0.22

It will be seen that the total catch, like the September catch, shows a reliable correlation with the bottom temperature at Drogden in July and August, and that there also seems to be a reliable relation with the frequency of the west wind in August.

4. The biological and practical significance of the connexion which has been established.

It is clear from the preceding section that the yield of the mackerel fishery in August, September, and October does not seem to depend directly on any of the factors which determine the surface temperature, since all the calculations correlating the yield of the mackerel fishery with these factors carried out gave much lower values for the relation than the calculation of the correlation between the surface temperature and the catch. The question now arises as to whether the relation between the catch and the surface temperature is due to the fact that the mackerel make their way in larger quantity into the coastal zone, where the pound-net fishery is carried on, in those years when they find a lower temperature than normal in the surface water, or to the fact that the water in those years when the temperature is lower than normal contains more food than is normally the case, and that the quantity of mackerel is determined by the amount of food.

A. C. Johansen[1]) has shown that the mackerel during their spawning migrations in May—June make their way into the eastern Skagerak and the northern Kattegat in quantity which are determined by the temperature, inasmuch as they appear in the greatest quantity in the years when the temperature of the water

[1]) A. C. Johansen: On the Influence of the Currents upon the Frequency of the Mackerel in the Kattegat and adjacent Parts of the Skagerak. — Medd. f. Komm. f. Havunders. Ser. Fiskeri Bd. VII. Nr. 8. 1925.

is lowest. It is particularly during the spawning season that most of the species of fish are greatly dependent on their hydrographical environment, but the commercial fishes at all events are generally dependent on it to a far less extent for the remaining part of the year, in their feeding seasons. When therefore in the late summer and autumn months in the Sound we find such a pronounced connexion between the temperature of the water and the size of the catch there seems a possibility that this is due to the dependence of the mackerel on the amount of food, which again may be determined by the temperature. According to the numerous investigations by Malm, Day, Möbius and Heincke, Holt, Smitt, Cunningham, Allen, Farran, Bullen, Nilsson, Blegvad, Scott, Ehrenbaum etc. the food of mackerel consists chiefly of planktonic crustaceans, fish fry, and small fish. Only in isolated cases have molluscs been found in the stomach contents (Ekstrøm). According to Allen and Ehrenbaum[1]), their food consists in spring essentially of plankton, and in the autumn of small fish.

An investigation of a small number of stomach contents of mackerel which I undertook in September 1930 showed very little content of food, only in some specimens indeterminable, largely digested remains of fish[2]). The mackerel in the Sound have been this year (1930) of bad quality and very scanty. (The temperature of the water at Drogden in September was above normal).

It may, however, be due to chance that in September of this year there apparently was a small quantity of food simultaneously with a small catch of mackerel and a high temperature. Unfortunately no regularly repeated investigations have been carried out on the amount of macro-plankton year after year, but the incomplete data which we possess as to the amount of food for mackerel in the different years seems to indicate that there is no connexion between the number of mackerel and the quantity of food. From the years subsequent to 1925 we possess the results of quantitative investigations on the amount of herring fry which have shown that the number of herring larvae caught in the Sound per 30 minutes' haul with a 2 metre ring trawl in 1925 amounted to 6, and thenceforward increased year by year until in 1928 it was 161 (fishing experiments in October)[3]). As also the catch of herring steadily increased during these years (as appears from the fishery statistics) it is probable that also the number of the one year's old herring, which together with the tiny herring fry are one of the most important elements of the food of mackerel, have been present in the Sound during these years in numbers increasing steadily from year to year. As is seen from Table 1, the catches of mackerel have not shown a corresponding increase since 1925.

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[1]) E. J. Allen: Report on the present state of Knowledge of the Habits and Migrations of the Mackerel. — Journal Marine Biol. Association. Vol. V. 1897. p. 9. E. Ehrenbaum: The Mackerel. — Rapports et Procès-Verbaux. Vol. XXX. 1923.

[2]) The material has been kindly placed at my disposal by Mr. Jens C. Jensen, smoking place owner. Copenhagen.

[3]) A. C. Johansen: On a correlation between the yearly catch of Herring in the Sound and the abundance of Herring Larvae in autumn. — Rapports et Proces-Verbaux. Vol. LXV. 1930.

It seems that the existing data may tend to indicate that the quantity of mackerel is directly dependent on the temperature of the surface water, inasmuch as the lower the surface temperature is found to be during these months the greater will the number of mackerel be finding their way up to the surface and in towards the coast.

The practical value of the investigation lies chiefly in the possibility of forecasting the fishery yield.

Thus, the catch which in September is landed at Copenhagen can be forecast with some degree of certainty from the frequency of the west wind in August and from the bottom temperature at Drogden in July and August. As appears from Table 2, the September catch can only with much uncertainty be forecast from the August catch.

Also, the size of the total catch in the Sound, N. of Dragør—Limhamn, can be forecast from the temperature of the bottom water in July, whereas from the monthly catches landed at Copenhagen it cannot be forecast with any degree of certainty until the August catch is known.

IV.

Aerial Spotting of Fish Shoals.

Danish Experiments in 1930.

By

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The Americans were the first to use aeroplanes in the searching for fish shoals. In 1919 W. W. Welch, Assistant at the Bureau of Fisheries, observed that fish shoals, which could not be seen from the bridge of a ship, were easily discerned from a seaplane immediately above the ship. During the following years aeroplanes were often used for the purpose of indicating to the fishermen the occurrence of tunny and sardine (San Diego, Chesapeake Bay), and the canneries procured their own "Prospecting Planes". From New Foundland Major F. C. Cotton searched out seals on flakes of ice and shoals of codfish in the sea.

In 1921 the French made some successful attempts atobserving fish shoals both from air-ships and seaplanes; both porpoise, sardine, and horse-mackerel were observed (see H. Heldt: La coopération de la navigation aérienne aux pêches maritimes. Notes et Mémoires, No. 12, Paris 1921).

Also in England similar experiments with seaplanes were made, in 1921 from Lowestoft, in 1923 from Plymouth, but without positive results (A. C. Hardy: Report on the Possibilities of Aerial spotting of Fish. — Min. of Agriculture & Fisheries, Fishery Invest. Ser. II, Vol. VII, No. 5, 1924). In 1924 the Scotch searched for herring in the North Sea by means of 3 aeroplanes, but these experiments gave no practical results either (see H. Wood and C. Mc. Gee: Aircraft Experiments for the Locating of Herring Shoals in Scottish Waters. Fishery Board f. Scotland, Scient. Inv. 1925, No. 1).

At Iceland, however, seaplanes have been used successfully at the searching for herring shoals. According to the "Alpýeubladid" from August 25th—29th, 1928, where the report of the Icelandic Aero-Company to the Government is published, the aeroplane "Sulan" was in many cases able to inform the fishing boats of the occurrence of herrings shoals. In Norway, too, attempts to locate the herring shoals by means of aeroplanes have been made during these late years, so far, however, without particular success.

While thus a systematic search for fish shoals from the air has been carried out in several other countries, such attempts were never made from Danish side.

Besides, as the Danish waters within the Skaw with their small extension might seem well fitted for a quick orientation as to the practical application of this method, I applied to the Chief of the Naval Air-Service, Orlogskaptajn A. E. V. Grandjean, in March 1930 and proposed him to make such an experiment. As my proposal was received with great kindness and interest for the question, the Director of the Danish Biological Station Dr. A. C. Johansen made an official application to the Ministry for Naval Affairs through the Ministry for Shipping and Fisheries that an aeroplane might be put at the disposal of the Station for this aim. Having received an obliging answer from the Ministry for Naval Affairs so that an aeroplane was gratuitously put at our disposal to a limited extent and only for the present year, all according to special appointments between the Chief of the Air-Service and the Biological Station, we started the flyings on July 22nd, 1930.

The plane we used was H. M. II, No. 99, a 3-seated Heinkel seaplane with a "Jaguar" motor of 440 horse power. Pilot was Mr. S. A. Dalbro, Chief Gunner; as wireless operator came Mr. Kramme, Air Mechanic, and the author himself took the observer's seat.

On the map page 93 the routes traversed are marked down.

On July 22nd, 1930, we started at 6 p. m. from Copenhagen. Route: Gilleleje Flak — Schultz Grund — Fornæs — Lysegrund — Gilleleje Flak — to the eastward of Hveen — Copenhagen. Landing at 8.10 p. m. Flying time 2 hours 10 min.

	Weather	Wind	Sea	Conditions of Observation
Copenhagen ...	bright	quiet	0	good
The Kattegat ..	overcast with showers	W.N.W. 4	3	less good, esp. in the northern part of the route.

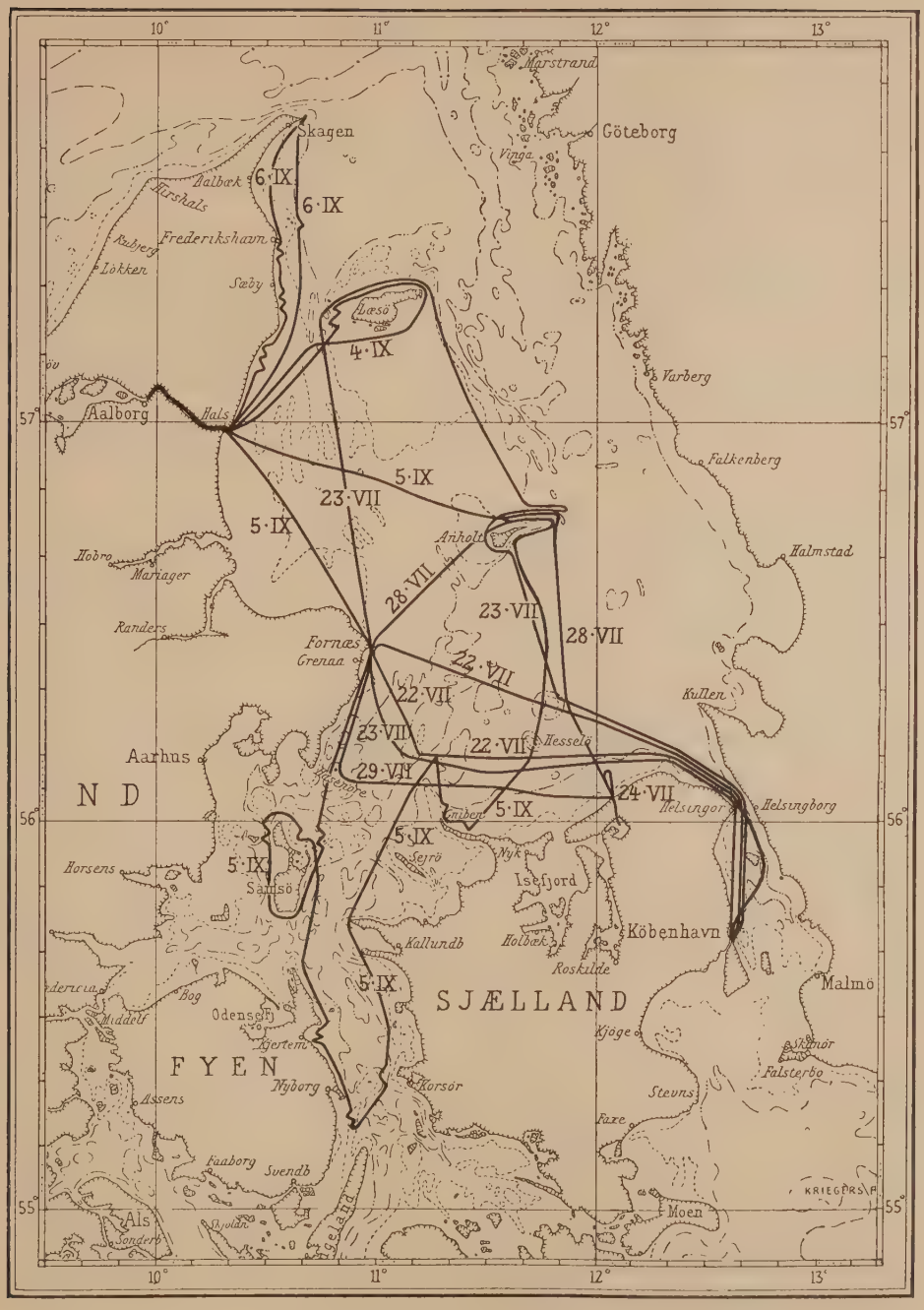
No fish shoals were observed.

On July 23rd we started at 11 a. m. Route: Copenhagen — Gilleleje Flak — Fornæs — Læsø Rende — round Læsø — Anholt Knob — round Anholt — Lysegrund — Kronborg — Copenhagen. Landing at 2.50 p. m. Flying time 3 hours 50 min.

	Weather	Wind	Sea	Conditions of Observation
S. of Fornæs to Anholt ..	$^1/_2$ cloudy	SW. by S.	0	good
N. of Fornæs to Anholt ..	overcast	quiet	0	less good

Abt. 100 seals were observed on the Anholt Eastern Reef; no fish shoals were observed.

On July 24th we started at 2.10 p. m. from Tisvildeleje for the route round Læsø, but after 10 minutes northward we returned on account of damage to the wireless. Flying time 20 min. Weather bright, wind and sea E. 1. No fish shoals were observed.



Flying routes during the spotting of fish shoals in July and September, 1930.

On July 25th—27th we did not start on account of rough weather and bad conditions of observation.

On July 28th we started from the Arresø at 4.40 p. m. Route: Tisvilde — Lysegrund — Anholt Knob — to the northward of Anholt — Grenaa. We had to land in the harbour of Grenaa at 6.10 p. m. on account of damage to the oil-refrigerator. Flying time 1 hour 30 min.

	Weather	Wind	Sea	Conditions of Observation
S. of Great Middelgrund ...	$^1/_2$ cloudy	S.W. 1.	0	S. of the line Gr. Middelgrund — Fornæs: good
N. of Great Middelgrund ...	overcast	S.W. 5.	4	N. of the line: less good

Abt. 100 seals were observed on the Anholt Eastern Reef; no fish shoals were observed.

On July 29th we started from the harbour of Grenaa at 11 a. m. and went by Hjelm to Tisvildeleje where we landed at 11.30 a. m. Flying time 30 min. Weather was very showery, wind changing, and sea 3. The conditions of observation were very bad; no fish shoals were observed.

During the following days weather was very rough and as, moreover, it was seen from the draughts of the fishermen that the herring was still going rather deep, we determined to put off the flyings to the first part of September.

On September 4th we started from Aalborg at 5 p. m. Route: Hals — Læsø Rende — Kobbergrunden — to the northward of Læsø — Læsø N. W. Reef — Hals — Aalborg. Landing at 7 p. m. Flying time 2 hours. In the Kattegat wind and sea were N.W. 2. Weather was bright, but in most places the observations were hampered by rough sea. On the sandy flats S. of Northern Rønner Light some few big cods were seen swimming, but no other fish were observed.

On September 5th we started at 7.40 a. m. Route: Aalborg — Hals — Fornæs — round Samsø — Fynshoved — Kerteminde Bay — Vresen — Musholm — Refsnæs — Schultz Grund — Sjællands Odde — Hesselø — to the eastward and northward of Anholt — Hals. Here we landed at 1.50 p. m. in order to fill up petrol. We started again at 3 p. m. and arrived at Aalborg at 3.30 p. m. Flying time 4 hours 50 min.

Wind and sea in the Kattegat and Belt Sea: S.E. 0—2, conditions of observation good. N. of Hesselø we saw one or two tunnies and at the Anholt Eastern Reef abt. 100 seals; no fish shoals were observed.

On September 6th we started at 7.20 a. m. Route: Aalborg — Hals — Hirsholmene — the Skaw — Frederikshavn — Hals — Aalborg where we landed at 9.15

a. m. Wind and sea in the Kattegat S.E. 3—4. Conditions of observation less good on account of rough sea. Nevertheless we observed $3^1/_2$ nautical miles S.E. of Asaa a shoal of mackerel forming a narrow streak with a length of abt. 500 m. and a breadth of abt. 50 m. nearly parallel to the coast-line. Apparently the shoal was nearly motionless or moved slowly towards the north. Information of this observation was sent to the National Broadcasting Company through the wireless of the Naval Aviation Base.

On September 7th we started from Aalborg at 7.30 a. m., but as wind and sea in the Kattegat were eastern, force 4—5, we turned back at Hals and landed in Aalborg at 9 a. m. The conditions of observation were bad.

On September 8th wind was still eastern, force 6—7, and the flying was given up.

At this time we had to break off our experiments as the machine could no longer be put at the disposal of the Biological Station.

Total flying time 17 hours 35 min.

The flyings were as a rule undertaken in a height of 200—400 m. above sea-level. From this height even comparatively small objects such as jelly-fishes, drifting sea-weed, etc. could be discerned quiet distinctly. The sea-nettles (*Cyanea capillata*) looked like small yellow stains, the sea-weed like brown, irregularly shaped specks on the surface of the sea. Sometimes the reflexes of the sun from the surface would make us think that we had come across a herring shoal, but in viewing the place from another angle we soon saw our mistake. With favourable conditions of observation the bottom of the sea could easily be observed at depths of up to 10 m. The vegetation of sea-weed on the bottom frequently takes the shape of long narrow streaks, e. g. S. of Læsø where the streaks go in a direction from east to west.

Very interesting is the observation of the great stock of seals which apparently have their place of resort at the Anholt Eastern Reef. This observation, compared with information given by fishermen all over the country, seems to indicate that the stock of seals in our waters has increased considerably during recent years.

The seals seem to swim by moving their hind-parts and hind-legs from one side to the other, but a closer study of this question will require cinematographic material; at future observation flyings it will be of considerable interest to take such moving pictures not only of seals but possibly also of tunny, porpoise, and shoal fish.

When, as it appears from the account given above, the experiments made cannot be said to have given any practical results for the fishing, this must in all probability be ascribed to the following facts:

1) Weather has highly impeded the flyings, so that the number of flying hours under favourable conditions of observation was only about 10.

2) The yield of the herring and mackerel fishery at the times and places in question was so inconsiderable, that the stock in the upper water layers no doubt was comparatively small.

3) The shoals of herring and mackerel, which must undoubtedly have been present at the places traversed, were going too far below the surface to be seen from the air.

The machine, however, was well suited for its purpose. The rate was convenient, the look-out good, and the manoevres quick and easy; the wireless functioned excellently even over the distance between the Skaw and Copenhagen. Finally it must be strongly emphasized that both the Chief of the Air-Service, Orlogskaptajn A. E. V. Grandjean, and the Chief of the Naval Aviation Base, Captain B. Scheibel did their best to secure a successful issue of the experiments. Also the pilot, Chief Gunner Dalbro and the wireless operator, Air Mechanic Kramme were always much interested in the experiments, and they have done an excellent piece of work. I thank all these gentlemen most cordially for good collaboration.

On the basis of this experiment there will of course not at present be any reason to attempt the establisment of a fixed arrangement of a rational searching for fish shoals by means of a hired aeroplane. However, in my opinion the experiments ought to be carried on and extended as they were obviously too short in duration to reply to the question: is the matter of practical interest for Danish fishery or not? If the experiments cannot possibly be continued in the same way as hitherto, it is recommendable to try to bring about an arrangement by which the search for fish shoals is combined with the execution of other kinds of service, e. g. the Inspection of Fisheries, which is carried out in the very places where there is a chance of coming across shoal-fish.

Danish edition issued December 1930.
English edition issued February 1931.

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Printed by Bianco Luno A/S, Copenhagen.